APRIL, 1932

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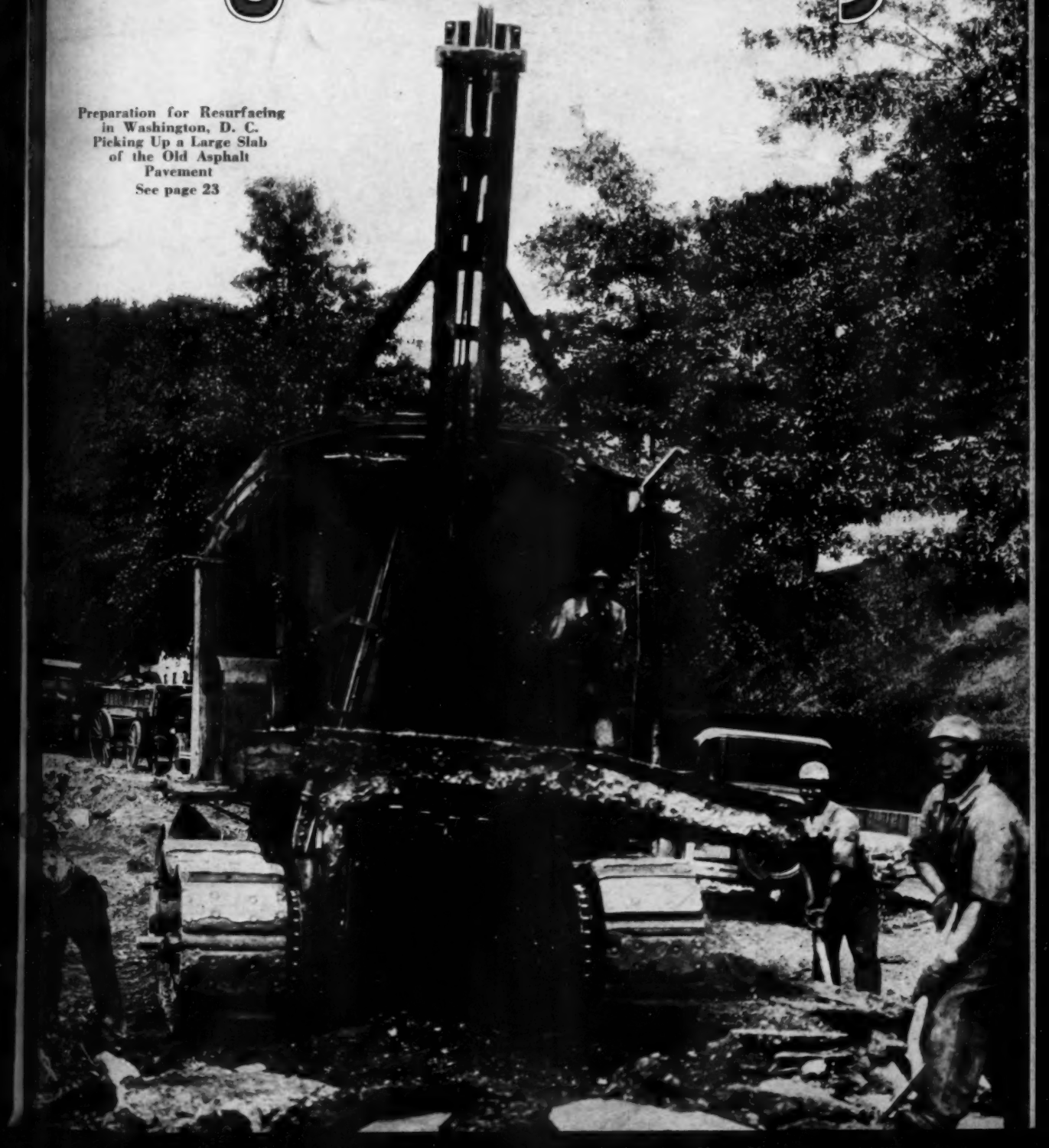
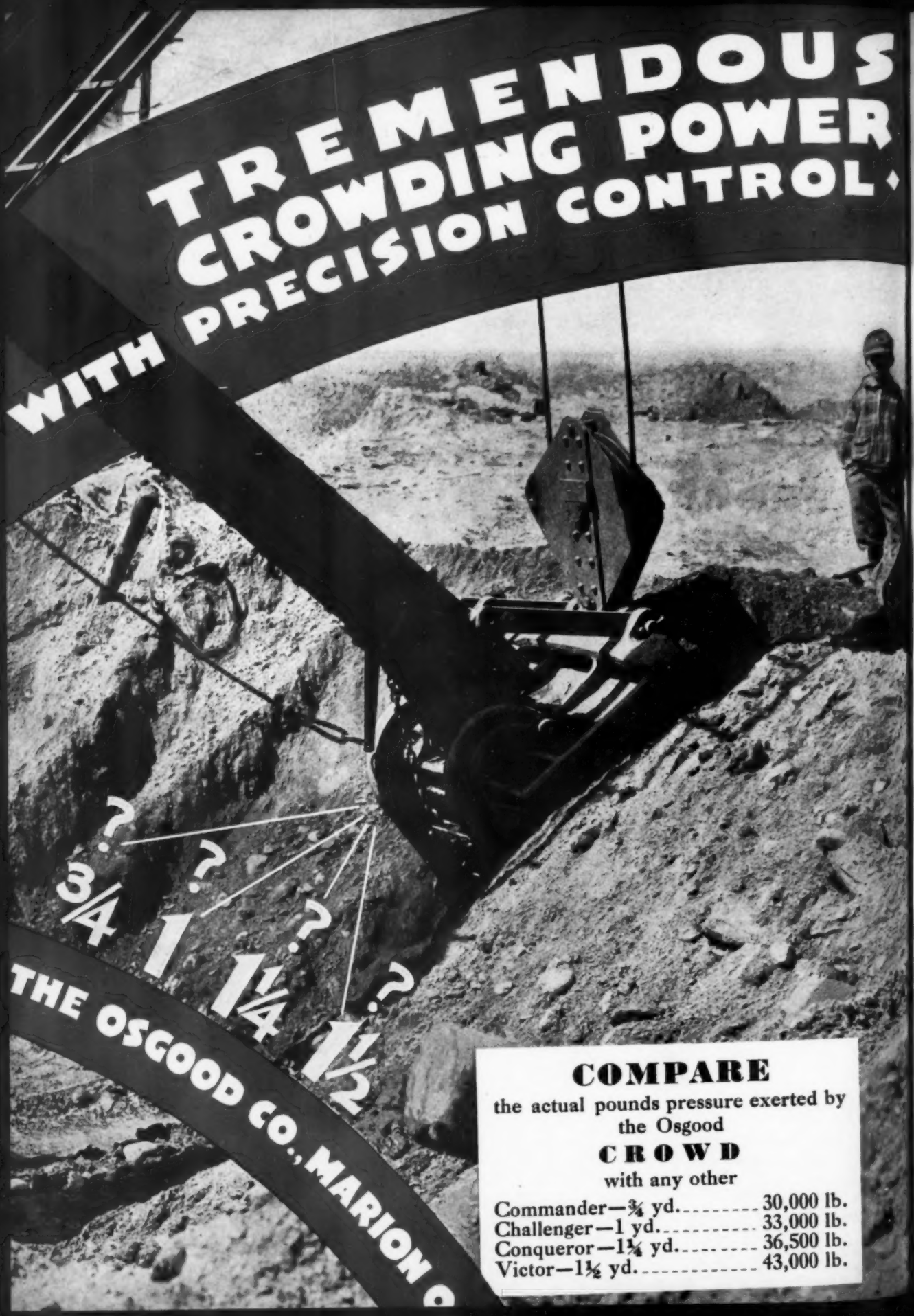


Preparation for Resurfacing in Washington, D. C. Picking Up a Large Slab of the Old Asphalt Pavement

See page 23


TREMENDOUS
CROWDING POWER
WITH PRECISION CONTROL
? ? ? ?
¾ 1 1¼ 1½
THE OSGOOD CO., MARION O
COMPARE
the actual pounds pressure exerted by
the Osgood
CROWD
with any other
Commander—¾ yd. 30,000 lb.
Challenger—1 yd. 33,000 lb.
Conqueror—1¼ yd. 36,500 lb.
Victor—1½ yd. 43,000 lb.

The Road

Over

Murder Hill

The Best Seams of Gravel Were Selected for Foundation Course Material

Sweeney & Boland

Built

Penetration Macadam Road

Over Route

Reputed to Be

the Third Highest in Elevation

on New York

State Highway System

GRUESOME as the name of the article may be, it has nothing to do with the quality of the work nor the activities of anyone connected with Contract 1876 under which Sweeney & Boland of Rochester, N. Y., built the 6.53-mile penetration macadam road between Ellicottville and Little Valley, N.Y., starting about the middle of August, 1930, and completing the work before Labor Day, 1931. The pavement varied from 18 to 32 feet in width, the wider sections being on curves and at the bridge approaches, and included a 12-inch gravel foundation course, a 4-inch bottom course and a 3-inch top course of penetration macadam and a section of ½-inch Amiesite top on a 9 per cent grade and on the bridges. A total of 250 working days was allowed by the State for the work and the contractor had nearly 30 to spare when the final estimate was completed. The road literally ran up hill from both ends to the high point at the middle with an 8 per cent grade from the Little Valley end and the 9 per cent grade from the Ellicottville end.

GRADING

As there was considerable relocation and some heavy grading the contractor put in four shovels at the start in August, 1930. There was an Osgood 1-yard gas and another Osgood steam shovel, an Erie ¾-yard steam shovel and a Keystone ¾-yard shovel with a skimmer scoop. All of the hauling for excavation was done by the contractor's own trucks although he hired most of the trucks for the later hauling of aggregate. A fleet of ten teams and wagons with eight trucks did most of the excavation, hauling with two Linn tractors and a Smith crawler wagon hauled by a Caterpillar Sixty. This equipment was sent to a new contract early in the spring of 1931 where even heavier excavation was encountered. A Caterpillar Sixty with a bulldozer handled the work on the dumps. Some of the 100,000 yards of excavation handled on this job was cast but the major part was hauled an average of 800 feet. There was no

rock in the road excavation, although a small amount was encountered in the excavation for some of the drainage structures. Most of the material was a slippery clay. Excavation was stopped in the middle of November, 1930, and started again April 15, 1931. When the Erie steam shovel was being pulled out for the winter it was mired up to the floor in the wet clay and had to be hauled out by the Linn and Caterpillar tractors.

When work started in April, 1931, the contractor had two good weeks in which he did as much work as in the whole of May. That month started out miserably but toward the close the weather seemed to be "contractor-conscious" as it rained Saturday nights and Sundays and cleared Mondays so that some work could be done that day and all was clear for a big haul the remainder of the week. No Sunday work is done on Sweeney & Boland jobs except such necessary overhauling as cannot be postponed. Man and machines both seem to need the seventh day layoff.

THE 12-INCH GRAVEL FOUNDATION

With a grade over 6 miles long and clay from end to end the contractor was fortunate to find two good gravel pits, one at each end of the job, for the foundation course which was 12 inches and variable in thickness. At the Little Valley end the Osgood steam shovel was worked in the pit which was a 1-mile dead haul from the end of the job. On the north end the Erie steam shovel worked about 3,000 feet in from the end of the job. The hauls were each about 3.25 miles in length up to the peak of Murder Hill at the approximate center of the job. The average haul was 1½ miles from the pit at the south end and 2½ miles from the north end. A total of 24,000 cubic yards of gravel was called for by the contract.

THE 4-INCH BOTTOM COURSE

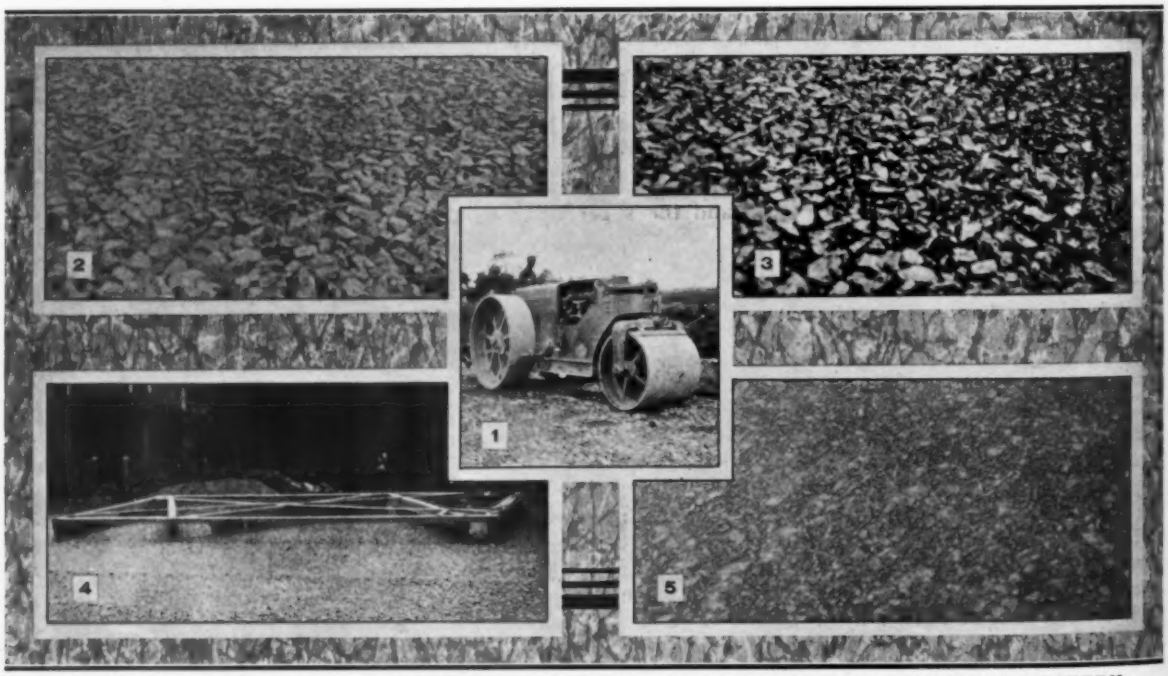
The contract permitted an option of crushed stone or slag for the 4-inch compacted bottom course. The contractor elected to use slag which cost more per ton than the stone but as the weight per cubic yard was less there was a real saving in the freight. The slag was received at both ends of the job over the Erie Railroad at the south end and the Buffalo, Rochester & Pittsburgh Railroad at the north end. The Buffalo Slag Co. furnished the material.

The slag was hauled to the job by a fleet of hired trucks which varied from twenty to twenty-five trucks and was spread in two strips by Burch spreader boxes to such a depth that it would be 4 inches when rolled. Blocks were set in the road at intervals to check the thickness of the bottom course and to aid the four men who trimmed the slag with stone forks and rakes. As soon as the bottom course was rolled it was lightly covered with fine sand and gravel hand cast over the surface by twelve men, the number varying according to the requirements and the speed at which the slag reached the grade.

THE 3-INCH PENETRATED TOP COURSE

No. 3 crushed stone varying from 1½ to 2¾-inch screen size was spread on the bottom course with the Burch spreaders and rolled. This was penetrated with 2 gallons per square yard of bituminous material A, supplied by Standard Oil Co. of N. Y., at 275 to 350 degrees F. Immediately after, so that there was not more

(*Continued on page 43*)



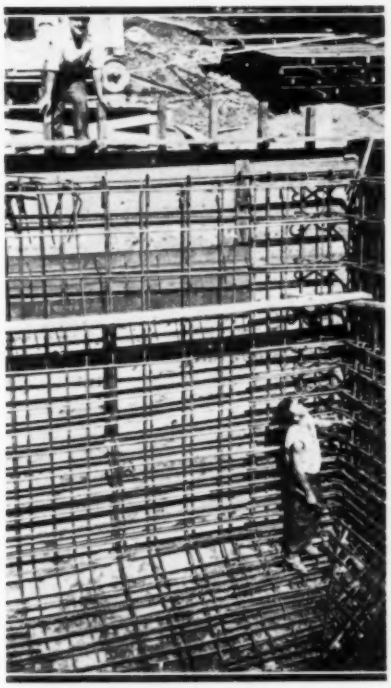
DETAILS OF BITUMINOUS PENETRATION CONSTRUCTION BY SWEENEY & BOLAND IN WESTERN NEW YORK

1. Rolling the base course. 2. Top stone rolled and ready for the asphalt binder. 3. Appearance of the top course immediately after the application of 2 gallons of binder per square yard. 4. The broom used to level up low spots before the seal coat was applied. 5. Appearance of the top before application of the seal coat.

Form Work *and* Material Handling *on a* Small Institutional Sewage Treatment Plant

O. W. Beard Construction Co., of Shelton, Conn., Built New Plant for Laurel Heights Sanitorium

THE Laurel Heights Sanitorium at Shelton, Conn., is maintained by the State of Connecticut for the treatment of those suffering from tuberculosis and has a present population of about 260 patients and a staff of 125. The existing sewage treatment plant being unsatisfactory, work was started early in the summer of 1931 on the construction of a new plant consisting of a bar screen, an Imhoff tank and an effluent line to the Housatonic River, all equipped for prechlorination. A covered sludge bed was built to permit drying of the sewage sludge from the Imhoff tank in all kinds of weather without nuisance and in the minimum of time. The entire plant was built about double the required size to allow for anticipated enlargement of the sanitorium.



Placing the Steel Reinforcement for the Wall and Hopper Bottom of the Imhoff tank

Chlorination House

The chlorination house which is 8 x 10 feet is built of North Haven brick laid in Flemish bond with a Spanish tile hip roof. The structure is equipped with Truscon steel windows and doors and oil-burning stove, chimney, testing apparatus and scales for weighing the chlorine cylinders supplying the Wallace & Tiernan chlorinator.

The Imhoff Tank

The Imhoff tank measures 25 x 17 feet 4 inches in plan and is 22 feet high from the top of the wall to the top of the sludge pipe. There are two flowing-through chambers, a central and two side gas vents. The outside walls of the Imhoff tank are 12 inches thick and reinforced with ¾ and ⅝-inch steel. The curtain walls are 5 inches thick and reinforced with ⅜-inch steel furnished with promptness and accuracy by Hunter & Havens of Bridgeport.

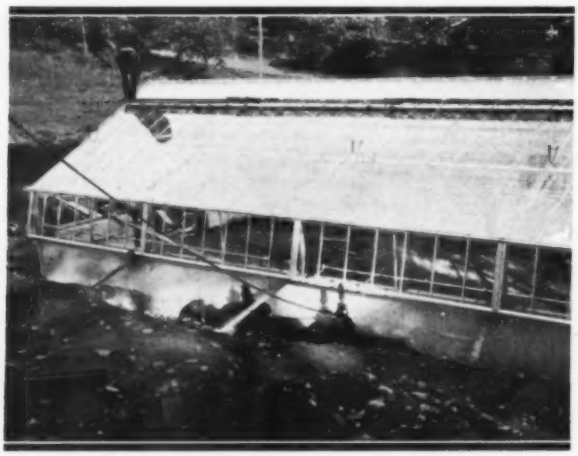
The volume of concrete in the bottom and outside walls of the Imhoff tank, which amounted to 60 cubic yards, was poured between 6:15 A.M. and 5 P.M. in one day, with 50 minutes out for lunch. The forms were made up of ¾-inch planed matched, tongue and groove 6-inch boards with 3 x 4-inch vertical studs 20 inches on center. Two 2 x 8-inch planks on edge were used for the horizontal wales. The spreaders for the

The Outside Forms for the Imhoff Tank Before Placing the Steel

forms were Tyscrus made of two 3/16-inch lacquered rods cut to 12-inch lengths, then electrically welded to spring-like coils about 1-inch long at each end, which formed the threads for the 15-inch lag bolts. The outside forms were set first, then the vertical horizontal steel for both inside and outside of the wall was placed and then the inner form was hung from 2 x 8's on edge across the narrow way of the tank.

HANDLING THE AGGREGATES FOR THE 60-YARD CONTINUOUS POUR

Sand and gravel for the concrete were delivered by truck to stockpiles at the top of the hill above the Imhoff tank. The aggregates were measured by struck wheelbarrow loads with one man shoveling to the sand barrows while another wheeled and one or two men shoveling to the stone barrows and two men wheeling. There was one man operating the Jaeger mixer and one man dumping the two bags of Atlas cement for the 1:2:4 concrete which was mixed 1¼ minutes. At the start of the work 5½ gallons of water per bag were used to give a 1-inch slump to seal the hopper bottom and the wall and hold the slope on the bottom. This was later changed to 7¾ gallons per bag of cement with a 6-inch slump to permit the concrete to flow rapidly behind the reinforcing in the walls. From three to five men were used to wheel the concrete from the mixer to the forms over a continuous runway made up of five 8-inch planks supported from the outside with 4 x 4's with 2 x 8's across the tank on edge, and cross braced. Thus the runway was entirely independent of the forms. Four puddlers with regular long handled concrete spaders were used continuously during the pouring, substituting lengths of reinforcing rods when some of the dried concrete tended to catch on the reinforcing and arch, threatening the formation of voids and honeycombs below. The concrete finishers worked on the bottom until midnight under the light of ten 250-watt lights which were strung around the tank.



The Glass-Covered Sludge Bed During Assembly of the Ventilators

THE COVERED SLUDGE BED

A Koehring 1¼-yard shovel handled all of the excavation for the side walls of the sludge bed which measured 48 feet 8½ inches x 24 feet 9½ inches. The sludge bed glass cover was erected by Hitchings & Co., of Elizabeth, N. J., and equipped with ventilators opening out at the sides and opening up at the top. Both sets of ventilators run the entire length of the glass cover. There are double doors at the ends, permitting a truck to be backed in at either end for the removal of the dried sludge.

THE FILTER SAND PROBLEM

The filter sand was secured from the Iron Ledge Sand & Gravel Co., Bridgeport, Conn., and was subject to the approvel of Warren Scott, Director, Bureau of Sanitary Engineering, State Department of Health. This sand which was a regular concrete sand did not pass specifications as there was too large a percentage of fines. After washing with an excess flow of water which flowed out the fines, the sand passed the rigid specifications for sludge bed filter sand. The capacity of the sludge bed is double that needed at the present time as is also the Imhoff tank and other units of the plant, as mentioned before.

All the cast iron fittings, gate valves and sluice gates for the control of the influent and effluent and the sludge were furnished by the Crane Co., of Bridgeport, Conn.

EFFLUENT LINE TRENCH CUT IN ROCK

A Byers Bear Cat shovel excavated the sewer trench for the effluent line to the Housatonic River. Fifty per cent of the trench was in rock which was drilled with one of the new fast I-R jackhammers supplied with air by a portable I-R compressor mounted on an International truck. Hercules 40 per cent dynamite was used to blast the trench.

PERSONNEL

The Laurel Heights Sanitorium sewage treatment plant was built by O. W. Beard Construction Co., Shelton, Conn., from the plans of J. Frederick Jackson, Consulting Engineer, New Haven, Conn. William E. Young was foreman for the contractor. The work was done for the State Tuberculosis Commission and the plans were approved by the State Water Works Commission. Robert Thomas was Resident Engineer for Mr. Jackson.

The Productivity *of* Labor

in

Street Work

UNDER modern labor-saving methods the work of paving streets is considerably subdivided. The main operations, in the sequence in which they are performed, are the breaking up and removal of the old pavement, the removal of old curb and setting of the new, the grading of the road bed, the pouring of the concrete base, the laying of the gutter, and finally the spreading of the binder and top courses. This work includes also the repair of sidewalk along the curb and the street intersections which may have necessarily been broken.

A Few Comparisons

The air compressor used in the street reconstruction projects studied operated tools which made the initial cut in the old pavement in less than 15 minutes, a job which would take a man with a hand pick and sledge hammer two hours. The trench excavator operated by one man with a helper can do as much work in one hour as 44 men using hand shovels. These are just examples taken from studies of street work made in Washington.

Work of the Compressor and Pneumatic Tool Crew

On the work studied, the gas-engine-driven air compressor was mounted upon a motor vehicle, thus making it possible to move it from job to job under its own power. It was equipped with pneumatic drills, cutter, spade, sprayer and blower, each operated at an air pressure of 80 pounds per square inch. The crew consisted of an operator and one or two laborers.

Where an old pavement was to be removed, the pneumatic drill or punch was used to make holes in the paved surface of the street and to break a hole 6 or 7 feet square so that the power shovel could begin work. If the operator worked alone, a hole of required size was broken in the surface of the old paving in about 35 minutes. To do this same work would take one man with hand pick and sledge hammer at least 3 hours where the pavement was 8 or 9 inches thick. In breaking paving at street intersections a line of holes was drilled through the pavement across the street. This was done to prevent the power shovel, while tearing up the old surface, from breaking the pavement at the intersection beyond the line of holes. The pneumatic tools were also used to break the side-

Removing an Existing Concrete Base and Sheet Asphalt Top with Keystone Excavators. The White House in the Background

walk at and near the curb and to cut a straight line across and through the top and binder courses where the new surface was to be joined with the old. The blower attachments were used to clean the surface of the concrete base of the street before the application of the binder course.

It required only 10 minutes for the operator of the pneumatic drill to cut through 1½ inches of finished coat and 1¼ inches of binder course, making a break about 15 inches wide for a distance of 34 feet across the street, for a joint between the old and new surface. An average man working with hand tools could not have done this work in less than half a day, or 4 hours. Using the blower attachments, the operator and two laborers in 2½ hours cleaned 1,180 square yards of concrete surface prior to the application of the binder course, an operation which would have taken two men with hand tools an entire day of 8 hours to perform, or nearly three times as many man-hours. In addition to the saving of time, the results obtained by the use of the machine were more satisfactory than those obtained by the hand method.

POWER SHOVEL OPERATIONS

The shovel used on the jobs studied had a bucket of 1-cubic yard capacity, a 12-ton thrust, a 21-foot boom and consumed about 35 gallons of gasoline in an 8-hour day. Its original cost was $11,250 and its estimated depreciation is 25 per cent per year. The crew was made up of one operator and two laborers. The number of trucks used in hauling the asphalt, stone and concrete, and dirt ranged from six to nine, depending upon the distance to which the material was hauled.

The operator of the shovel had had 14 years experience in the work and handled the machine perfectly. This is important as the efficiency of the power machine is identical with the efficiency of the operator. Working under favorable conditions, this operator loaded 4 bucketfuls or an average of about 3½ cubic yards per minute. Because of his efficiency in grading, there was little or no dirt left for the fine grading crew to remove.

The two laborers of the power shovel crew worked along with the shovel, usually one on each side of the street. They shoveled the loose material from along the curb toward the middle of the street and broke up with sledge hammers the large slabs of asphalt and concrete as they were turned up by the shovel, so that the pieces could be picked up by the shovel and loaded on to the trucks. The material salvaged from the streets was used in improving dirt streets, while the dirt was sent to dumps and fills.

The number of truck loads of asphalt and concrete broken and loaded by the shovel in five 8-hour days on which the shovel was working to capacity were 54, 56, 57, 59 and 54. On three of the five days no dirt was loaded. On one day 4 truckloads of dirt were removed and on another day 2 truckloads. At the rate of 3½ cubic yards of salvaged material per truck, the number of yards removed per day was 189, 199, 206 and 189. This was an average of almost 196 cubic yards per 8-hour day or 24.5 per hour. The number of cubic yards per man-hour was a little less than 8.2. The man-hour output of this shovel may appear very low especially if compared with the record of a shovel excavating and loading dirt only, but it should be borne in mind that it takes as much or more time to break up the asphalt and concrete as to load it onto the trucks.

The man-hours that would be required to break and load by hand a total of 196 cubic yards cannot be estimated with any degree of certainty because very little of this work has been done by hand. Judging from the time taken by a laborer, using a hand pick to break the concrete between the gutter and the manhole, that could not be reached by the shovel, the cost of hand labor would be prohibitive.

THE CURB CREW

The curb crew consisted of a foreman, two curb setters, a stone cutter, a stake setter and about fifteen laborers. The work of this crew was done entirely by hand. The crew took up the old curb, dug a trench 15 inches deep and 18 inches wide and set the new curb in the trench according to grade.

Curbstones vary in thickness and depth. Those for one street were 8 x 8, another 8 x 12 and still another 6 x 20 inches. The curb used at street intersections may be of greater depth than that elsewhere in the street. Stones 8 x 8 and 8 x 12 inches are set on a concrete base, while those 6 x 20 inches are set on spalls and cemented at the joints.

The concrete used for the curb was mixed at the plant of the contractor, delivered to the job by trucks, and dumped onto a steel pan about 8 feet square. Although the concrete was moist, it was not soft and did not give under the weight of the curbstones while they were being set. If the concrete were very wet the heavy curbstone would sink into it and the alignment of the various pieces would be a difficult job.

In making the base for 8 x 8 and 8 x 12-inch curbstones, the laborers took the concrete from the steel pan and spread it to a thickness of 6 inches in the bottom of the trench, tamped it, using a steel tamper 10 x 10 inches in size and, including the handle, weighing about 20 pounds. The stake setter then placed the stakes showing the grade for the curb and ran a cord from stake to stake marking the grade line and also the outer line of the curb. The curb setters and helpers placed the curbstone on the concrete base with crowbars and brought each stone to the correct grade and line. The concrete base was cut through to the dirt, on the street side in line with the curb so that the brick gutter might be laid at the proper depth below the top of the curb. The number of linear feet of curb that can be set varies from day to day and hour to hour due to the differences in the dimensions of the stones, the weather, and other conditions.

FINE GRADING CREW

The fine grading crew consisted of a foreman, a road scraper and roller operator and about fifteen laborers. They brought the subgrade of the street to the proper contour. With the exception of the work done by the road scraper and a 10-ton roller, all of the operations of this crew were done by hand. The power scraper cut dirt from the street in grading and left it in windrows which could be easily shoveled and moved to fill low places in the bed. This machine was able to make a more even grade than could be made by hand with pick and shovel and also saved labor. It was operated by

one man and cut and graded a space about 6 feet wide and 1,000 feet long in 15 minutes or less. It cannot be used to advantage around manholes, short turns or corners or near the curb, such work being done by hand.

The next work after the grading was the setting of iron stakes in the street bed and the running of the cord from stake to stake to mark the top of the finished pavement. If the street surface was to be 10½ inches thick, 8 inches of concrete and 2½ inches of binder and top or finish course, the bed was so graded that it would be 10½ inches below the cord, the high places being leveled and the low places filled in by laborers with hand shovels. As soon as the elevations were correct, the 10-ton roller was run over the grade, packing the dirt firmly and making it ready for the pouring of the concrete. The grading and curb-setting crews, about thirty men, in one day of 8 hours graded 1,900 square yards. The grading crew alone, consisting of fifteen men, in the same length of time graded 840 square yards.

The foreman for the grading crew ordered the bricks for the gutter. After they were delivered, the laborers stacked them on the curb so that they would be ready for the gutter crew.

THE CONCRETE CREW

The concrete crew consisted of a foreman with from twenty-five to twenty-seven men and seven or eight trucks. The cement was trucked to the job and unloaded to the road bed a short distance in front of the mixer, and as needed was wheeled directly to the skip of the paver and unloaded near the front at the side of the skip. One man handled the cement. Sand and gravel properly proportioned was delivered by truck and dumped directly into the skip. Each truck carried three or four batches of 1,245 pounds of sand and 2,123 pounds of gravel. Two men opened and dumped four bags of cement for each batch. The mixer operator spread the concrete with the bucket after mixing it 1¼ minutes.

Forms for the concrete consisted of 8 and 9-inch timbers, 4 inches wide placed 10 feet apart and extending from a point 14 inches from the curb on one side of the street and the same distance from the curb on the other side. The placing of these temporary forms was handled by a crew of three men. The concrete was spread by five or six puddlers and tamped by two men using an iron screed weighing 200 pounds and measuring about 14 feet long and 8 inches wide with handles at each end. One tamper stood on boards laid across the street from curb to curb on the newly poured concrete while the second tamper stood on the subgrade.

A form 14 inches wide, 4 inches deep and about 10 feet long was set along each curb to make a channel for the gutter. A 7-inch foundation course of concrete formed the base for the gutter. The 2-inch space above the concrete was used for laying the brick gutter.

The tampers were followed by a man using a shovel to further smooth the surface. The surface after initial set was swept with a stiff, long-handled brush to permit the binder course to adhere.

On hot days after the concrete was poured, it was sprinkled to aid in the curing. The amount of concrete that can be poured in one 8 or 9-hour day varies to some extent with the width of the street. A narrow street requires more frequent moving of the mixer than the wide street. The following table shows for each of five days on one job and for one day on another job the number hours that the concrete mixer was in operation, the number of men in the mixing crew, the number of man-hours for the crew, number of cubic yards of concrete poured and the average number of cubic yards per man-hour exclusive of the hours of the drivers of the

Concreting Organization for a 9-inch Concrete Base. Note the Hand Screed and Plank on the Green Concrete for One of the Operators.

Batching Two Smith 27-E Pavers for Resurfacing, Between the White House and the State, War and Navy Building, with a 9-inch Concrete Base and Sheet Asphalt Top

trucks. The average number of cubic yards poured per man-hour on the fifth day on Job A was only 0.79. The job was completed on that day and the mixer was in operation only 1½ hours. The averages for the other four days are representative. The average by days ranges from 0.97 cubic yards per man-hour on the third day to 1.07 on the second day.

HOURS OF OPERATION AND OUTPUT OF CONCRETE MIXING CREW ON EACH DAY

Job and days	Mixing crew: Hours mixer was in operation	Mixing crew: Number of men	Mixing crew: Man-hours worked	Cubic yards poured: Total	Cubic yards poured: Average per man-hour (exclusive of hours of truck drivers)
Job A:					
First day	8	27	216	220	1.02
Second day	8	27	216	232	1.07
Third day	*7	27	189	184	.97
Fourth day	†5	25	125	132	1.06
Fifth day	‡1¼	27	40½	32	.79
Job B:					
One day	§11	27	297	300	1.04

*Changed to other work after working 7 hours, as grade at street intersection was not ready. †Stopped by rain. ‡Job A completed on this day. Machine moved to Job B. §Two crews; 1 worked 8 hours and the other 3 hours.

THE GUTTER CREW

The gutter crew included a paver or setter, a grouter and three laborers, who laid the gutter on each side of the street on the concrete foundation. The gutter extended 14 inches into the street from the curb, had a pitch of 1¼ inches, the curb edge being much lower than the street edge, and made of one layer of vitrified bricks, 9 inches long, 4 inches thick and 3¾ inches wide and grouted.

A dry-mix cement and sand bedding course consisting of one part cement and two parts sand was spread 1½ inches thick on the foundation. The mixing and spreading of the bedding course was done on the job by one laborer. Other laborers placed the brick along the street near the curb within the reach of the paver. The paver smoothed the bedding course to an even thickness and laid the brick on it. In laying the gutter, the paver placed a whole brick crosswise of the channel, then broke one brick into two equal parts and placed one part at each end of the whole brick leaving a space of about ½ inch between the two, making the gutter about 14 inches wide. In the next row the positions of the half brick and the whole brick were reversed so that the joints were not in line. The grouter poured water on the bricks after they had been laid. The water seeped through the joints to the dry concrete beneath, binding the bricks and the concrete to form a solid bedding course. The grouter then mixed water and cement and sand which was poured on the bricks to fill the joints and to form a thin coating on top. This was swept onto the bricks thoroughly to force it into the joints. The grouter placed sand along the street edge of the gutter to keep the grout from running from the gutter as the top of the brick gutter was about 1½ inches above the surface of the concrete in the street. A little less than 4½ bricks were required for 1 square foot of gutter and 40 for 1 square yard.

THE BINDER AND ASPHALT SURFACING CREW

The asphalt crew consisted of one dumper, six forkers or shovelers, five rakers, two tampers, three or four handy men and two roller operators. The forks were used in spreading the binder course and shovels in spreading the top course. The number of trucks used in hauling the hot mixed material from the plant to the job was governed by the distance of the haul. The 10-ton roller consumed approximately 20 gallons in an 8-hour day and 3 gallons of oil a week.

The binder course consisted of crushed stone and asphalt thoroughly heated and mixed at the asphalt plant. It was hauled to the job in steel body trucks, dumped in small quantities as directed by the dumper and then spread to an even thickness of about 1¼ inches by the rakers, compacted by the tampers and the 10-ton roller.

The top course consisted of asphalt, sand and limestone dust heated and mixed at the asphalt plant. It was hauled to the job by trucks and dumped into two 10 x 8 foot steel pans. From these it was distributed over the surface of the binder course by the shovelers

and spread by the rakers to a thickness of 2 inches. It was hand tamped along the edge of the gutters and around the manholes and then rolled to a finished thickness of 1½ inches. The steel pans were used to prevent heating the binder course too much and also to save time in spreading the material. The pans were pulled forward by the trucks as needed.

HOURS OF OPERATION AND OUTPUT OF BINDER AND TOP CREW

Operation	Period worked		Man-hours worked	Square yards covered Total	Average per man-hour (exclusive of hours of truck drivers)
	hrs.	mins.			
Binder course	6	0	120	3,360	28.0
	2	15	45	1,180	6.0
Finish course	6	0	120	2,200	18.3
	3	35	72	1,040	14.5
	8	0	160	3,045	19.0
	3	30	70	1,130	18.9

The lowest performance figure shown in this table, 14½ square yards, is not representative as a heavy rain had soaked the sand the previous evening, slowing up the work both at the asphalt plant and on the job.

SIDEWALK REPAIR

The pneumatic pavement breaker was used to break up the concrete sidewalk along the curb and at street intersections. The broken material was shoveled by hand into trucks and hauled away. The area repaired was graded to a depth of 5 inches to allow for 4 inches of concrete base and 1 inch of sand and cement top finish. The base was mixed at the plant and delivered to the job by trucks. The concrete was spread with hand shovels and tamped thoroughly and the finished coat which was mixed on the job was then applied. A crew of twenty-one men in an 8-hour day loaded and replaced 182 square yards of broken sidewalk.

ACKNOWLEDGMENT

The material on which this article is based was made available by the Editor of the Monthly Labor Review of the U. S. Bureau of Labor Statistics and Edward Costigan, President, Corson & Gruman Co., Inc., General Contractors, Washington, D. C., whose work was studied as a basis for this material. The illustrations for this article and the front cover of this issue were furnished by Corson & Gruman Co., Inc.

Settling Fills *by* Jetting

Method Required of Contractors in Illinois on All Fills Over 3 Feet High

ALL fills for highways in Illinois, if they are 3 feet or over in height, must be settled by jetting. The process is similar for sand, gumbo, clay or rock fills but the results are somewhat different. In rock fills there is practically no settlement and the method is really not suitable. On the other hand in clay and gumbo the settlement is apparent.

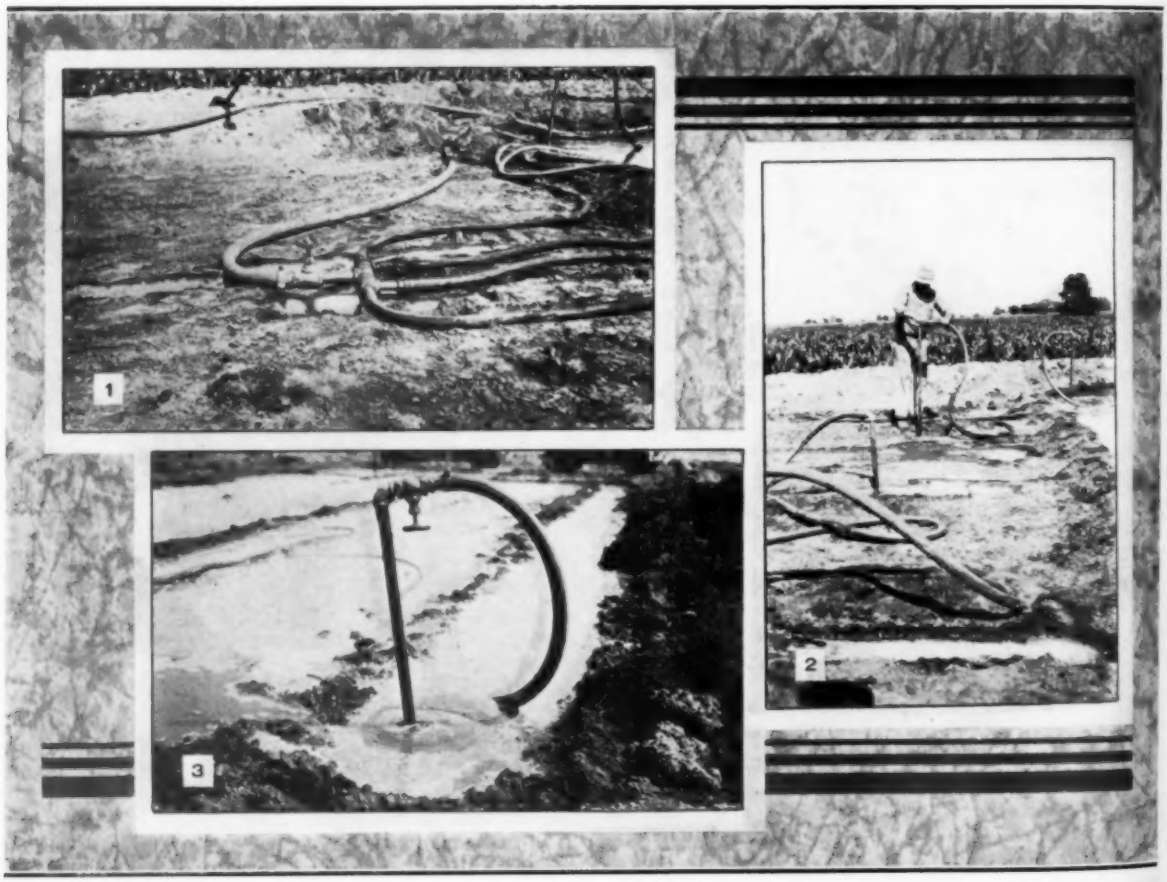
The fill on which the work described in this short article was done was located west of Geneseo, Ill., across the bottomlands between the Green and Rock Rivers and not far from the western border of the state. The fill was of sand with some black soil stripped from the top of the borrow pits during the making of the fill by an elevating grader outfit. The average height of the fill was 6 feet and the width 20 feet for the roadway with 8-foot shoulders. In preparation for the jetting four furrows were plowed down the roadway about 6 feet apart. These furrows and the ridges formed by the plowed-up earth made channels which allowed the water from the jetted holes to run back down grade and sink

into holes farther back and thus further saturate the grade and permit the maximum of settlement. Thus no water which might boil up in the hole after the jet had completed its work was wasted, as it ran back to complete its work. Great care was taken to watch the sides of the fill to see that the water did not run through open places in the fill and thus wash out the fill instead of settling it.

Water for the jetting was supplied by a C H & E 3-cylinder pressure pump through a 2-inch pipe line laid along the shoulder. From it 2-inch hose connections were made which carried manifolds for four 1-inch hose which were connected with control valves to the jetting pipes. These were 1-inch pipes 6 feet long for the fill being settled and always about the same depth as the fill being worked on so that they could be run to within 1 or 2 feet of the bottom of the fill and still leave enough pipe above the surface to make the manipulation of the jet easy. The pipes were pointed at the outer end by slitting the pipe and then constricting it to a ½-inch opening.

The pipe was started down into the fill with just enough pressure to sink the jet and as the maximum depth was reached the pressure was reduced to such a point that the fill would take up all the water. As soon as the water began to boil up again in any quantity it was a sign that the fill was saturated and the jet was shut off, withdrawn and placed about 6 feet distant in the same furrow in the upgrade direction. In the sand fill where the work was inspected it required about 10 to 15 minutes for the fill to become saturated at any one point.

The actual settlement of the fill is seldom visible to the naked eye and the drop in the grade reaches only 0.1 to 0.2 feet even in clay which, as expected, shows the maximum settlement because of its nature. In forcing the jets down into the fill they sink very rapidly in sand but when lumps of black dirt or clay are met it brings up quickly and has to be worked around to get it through the harder material. Standard practice requires that the jetting progress from the top down rather than by forcing the jet to the bottom of the fill and allowing it to fill up with water in that manner. Saturation of the fill from the top layers first, gradually working to the base, gives a more complete job. If stones are met in the sinking, the jet is removed and placed a few inches to one side or the other, but still in the furrow, so as to avoid the stone. Great caution is taken in rock fills where the large pieces of stone offer opportunity for the formation of channels to carry the water away without settling the earth between the stones and above the rock fill section.



A JETTING OPERATION IN ILLINOIS

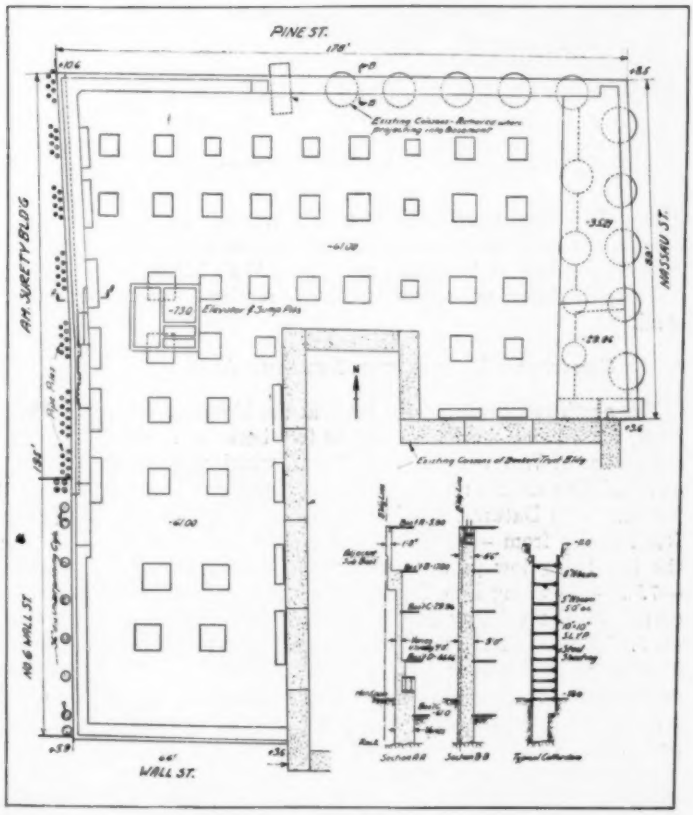
1. *A 2-inch hose from the pipe line to a manifold supplying four jetting pipes.* 2. *Starting a jet in one of the prepared furrows.* 3. *Water and mud boiling up from a jet showing that it should be shut off and withdrawn.*

An Unusual Foundation Job *in* Lower Manhattan

By

Chas. Scott Landers

Consulting Engineer
New York City



The Foundation Plan for the Bankers Trust Company Addition

THE substructure of the Bankers Trust Co. Building addition on Pine, Nassau and Wall Streets, New York City, is of the enclosing cofferdam type and includes five basements below street level. It is the deepest cofferdam in lower Manhattan constructed through unstable ground without the use of compressed air, and is an advance in the use of the open method of foundation construction, which has been replacing the pneumatic method in lower New York City in the last three or four years.

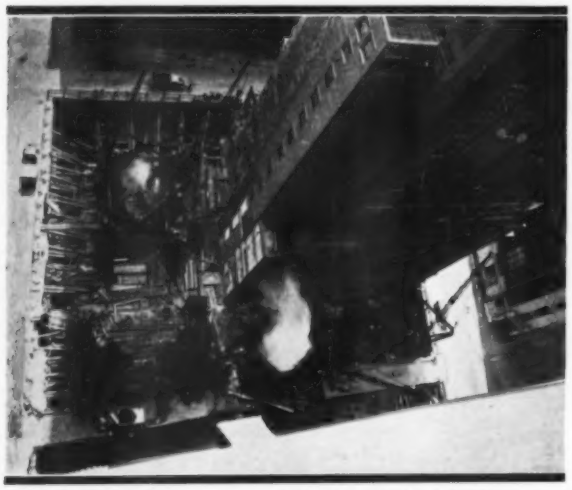
Rock in lower Manhattan is overlain usually with a compact hardpan, varying from 1 to 20 feet in thickness. This hardpan is a dense, well graded mixture of sand, clay, gravel and boulders, requiring the use of paving breakers for excavation. Over the hardpan and to approximately ground-water level is a layer of fine red sand and clay, locally termed quicksand. This material in its natural state is in thin strata, up to 1 inch in thickness, and the ground-water is largely in between these laminations. The material as laid down does not appear to contain much water, but any puddling or flow of water converts it into a fluid.

It is this quicksand, and the danger of losing ground while working in it which has, until recently, required the use of compressed air in deep foundation work in lower Manhattan. It is the existence of the underlying hardpan, which permits the sealing of sheeting to impervious material at the bottom of a cofferdam, which makes possible the use of open excavation methods. To a great extent also, the development of this method is due to improvement in the use of steel sheeting.

Surrounding Structures

The building, which is to be 22 stories high, is located at the southwest corner of Pine and Nassau Streets, with an ell running south and through to Wall Street; and adjoins the west and north sides of the existing Bankers Trust Co. Building, at No. 14 Wall Street. The area inside building lines is 24,000 square feet. The northeast portion of the lot was occupied by the Hanover Bank Building, a 22-story structure erected in 1902 on piers to rock sunk by compressed air methods, and the remainder of the lot by 8 to 10-story buildings on spread footings on fine sand.

Across Wall Street is the Stock Exchange, and across Pine Street is the Equitable Building, both on caissons to rock. In Nassau Street is the new Nassau Street subway of the B.M.T., a floating structure, and east of it is the Sub-Treasury Building, underpinned to hardpan. The existing Bankers Trust Co. Building is on a caisson cofferdam to rock sunk by the pneumatic method in 1910. On the west side of the lot is the American



The Plant Layout at the Beginning of the Job Showing the Timber Bracing Supporting the Streets, the Existing Building and the Annex under Construction

Surety Building, a 22-story structure resting, for the portion adjoining the new foundation, on steel pipe piles jacked or driven to hardpan; and No. 6 Wall Street, a 10-story building on spread footings, resting on fine sand.

Conditions Within the Building Area

The northwest corner of the lot is at the highest street level, there being a difference of 10 feet between it and the corner of Wall and Nassau Streets, which was used as a building datum and to which all elevations are referred. This Datum is 23 feet above the City Datum. Rock varies from —60 to —75 along the west side of the lot, being low in the northwest corner, and from —75 to —69 along Pine Street. Rock at the northwest corner of the existing Bankers Trust Building is at —65. The rock is the much-folded mica schist of lower Manhattan and was in several places folded, crushed and shattered. Over the rock is hardpan varying from 2 to 18 feet in depth, above which is 45 feet of fine sand and clay. Over the quicksand, which existed up to groundwater level at —17, is a layer of sharp medium sand.

The elevations of the five basements are respectively —5.80, —17.80, —29.96, —44.46 and —61.00. Their floor arches are of stone concrete and are designed to act as permanent bracing for the exterior walls. The lowest basement floor is placed on an 8-inch drainage bed of gravel which is drained to a sump having an automatic pump. Under machine bases the drainage bed is omitted, the floor slab resting directly on rock.

The exterior walls are generally from 4 feet 6 inches to 5 feet thick below the grillages which they carry. Grillages are located at the basement B level at —17.80. Above the grillages, the walls are generally 2 feet 6 inches thick. Along the west wall, below basement B, the wall is generally 3 feet thick. This wall carries no grillages except in the lowest basement, and there the grillage footings and wall are combined. All exterior walls are sealed to solid rock, mica schist and gneiss. They are designed to span vertically from floor to floor and are of 1:2:4 concrete, except the wall adjacent to the American Surety Co. Building and for 3 feet below grillages, where 1:1½:3 concrete is used.

Along Nassau Street, the first bay west was carried to basement C level only. The wall on the building line was designed to support column loads as a continuous girder spanning between the existing caissons of the Hanover Bank Building, which were utilized as footings. The existing caissons were also utilized to form part of the Pine Street and lower Nassau Street walls.

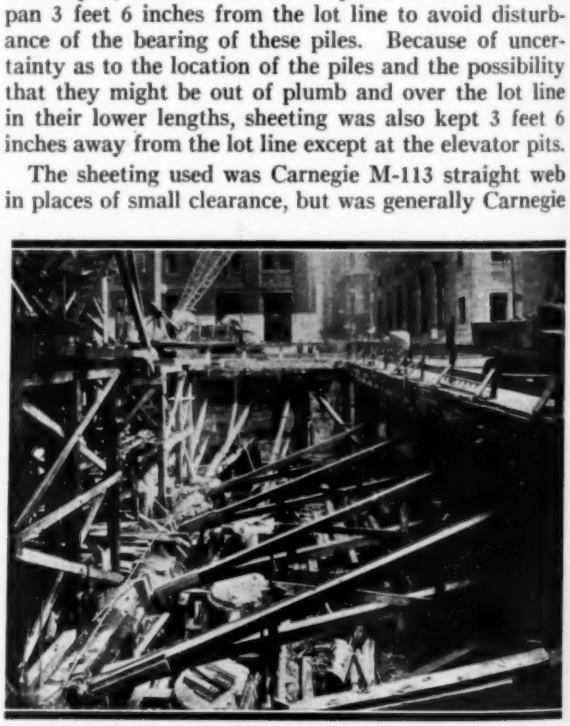
All major construction joints are drained and led to the drainage course under the lowest basement floor. The whole interior of the sub-structure is waterproofed with cement waterproofing, outside all structural steel, and it is expected that leakage into the drainage bed under walls and through construction joints will not exceed 250 gallons per hour.

Method of Construction

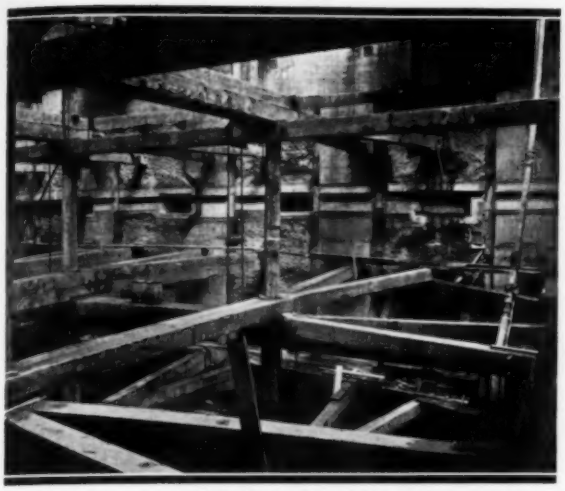
The method of construction was to build the exterior walls in sections in steel sheeted cofferdams, and upon their completion to excavate the entire lot as a unit to subgrade, carrying the lateral stress by temporary timber cross-lot bracing until the steel and floor arches were in place.

Before commencing excavation of the cofferdams the building at No. 6 Wall Street was underpinned by means of eight pneumatic cylinders jacked down to rock. These were 36 inches in diameter, of ½-inch plate, and filled with concrete. The northeast corner of this building had already been underpinned with pipe piles to hardpan at the time the American Surety Co. Building was erected. Owing to the fact that the American Surety Co. building was supported on pipe piles jacked to hardpan, it was decided to keep construction in hardpan 3 feet 6 inches from the lot line to avoid disturbance of the bearing of these piles. Because of uncertainty as to the location of the piles and the possibility that they might be out of plumb and over the lot line in their lower lengths, sheeting was also kept 3 feet 6 inches away from the lot line except at the elevator pits.

The sheeting used was Carnegie M-113 straight web in places of small clearance, but was generally Carnegie



The Bracing Supporting the Nassau Street Subway. Old Piers of the Former Hanover Bank Building May ***Be Seen Through the Bracing.***



The Pine Street Wall Made Up of Old Caissons and New Walls Between, Showing Also the Horizontal Chase for the Floor

M-111 arch web. It varied in length from 37 to 50 feet. The sheeting was driven from approximately the subgrade of the old Hanover Bank basement into hardpan, penetrating from 6 inches to 1 foot 6 inches into the hardpan. The cofferdam sections were 8 x 17 feet along the American Surety Building, 8 x 30 feet along No. 6 Wall Street and Wall Street and 8 x 30 feet along Pine Street west of the old Hanover Bank Foundation. Along Pine and Nassau Streets, where the existing caissons were, the sheeting was driven to include the outside rows of caissons. In this case, where it was necessary to sub-divide the cofferdam into sections, a seal between the old caissons and the sheeting was effected by the use of grout.

Excavation

Alternate sections of cofferdams were excavated at a time. As excavation progressed the sheeting was braced, steel wales and struts being used where the bracing would be included in the concrete wall. On reaching hardpan excavation was carried to rock in boxes not over 15 feet long, except along the American Surety Co. Building, where the boxes were about 4 feet long and carefully breast-boarded. Alternate boxes were excavated and concreted before starting those remaining. The driving of sheeting and the excavation of the cofferdam were accomplished with the use of seven stiffleg derricks mounted on trestles at street level. All excavation was by hand. During the cofferdam excavation the old sidewalk vault walls holding the street were braced to the old interior footings.

General Excavation

On completion of the cofferdam and concrete wall the derrick layout was changed for general excavation. Piles were driven to carry the machine loads and other piles were driven to support the cross-lot bracing. As excavation was carried down the timber cross-lot bracing was placed, laid out to clear the steel later to be erected. This bracing consisted of four main tiers, with additional spur shores at the bottom. Its cross section varied, depending on location, but generally was two 12 x 12-inch short leaf yellow pine in the two upper tiers and four 12 x 12-inch short leaf yellow pine in the two lower tiers. The bracing was set up with steel wedges and at intersections was held together with posts and tie rods. Sufficient vertical bracing was placed to stiffen the whole and to prevent collapse in case of the shooting out or removal of an individual post. In erection, the bracing was supported by ledgers or timbers bolted on to pairs of piles, the piles being fleeted down as the excavation reached their points, and later removed, then being replaced by posts between the tiers of bracing. Great care was taken in the framing and setting of the bracing, and it was constantly observed to see that it remained true to grade and that all slackness was immediately taken up by the wedges.

General excavation was taken out at the average rate of 1,100 cubic yards per 24-hour day. Six stiffleg derricks were used, and all excavation was by hand, as owing to the irregular shape of the lot, the presence of old caissons and the amount of excavation, the use of excavating machinery was not justified. Excavated material was loaded directly into trucks on the street and on a loading platform built into the lot from Wall Street.

On completion of the general excavation forty-five interior piers and a sump pit were excavated. Piers on the average were 7 feet 6 inches square and, except those adjacent to walls, supported billets instead of grillages. Excavation of piers was in hardpan or rock and presented no difficulty.

Waterproofing was started about the time of completion of general excavation, and all beam and grillage pockets, column and floor-slab chases were waterproofed with a $\frac{5}{8}$-inch cement finish before the erection of steel, the remaining surfaces being left until the floor-slabs were in place to save time in steel erection, damage to the coat and to save scaffolding. The lowest basement floor and drainage bed were left to be completed after structural steel was erected to street level.

Old Foundations Encountered

It is interesting to note the old foundation of the

The Existing Bankers Trust Building Showing the Four Tiers of Heavy Cross-Lot Bracing Supporting the Wall Surrounding the Lot

Hanover Bank Building. This building was built in 1902 on individual piers of pneumatic caissons of the type devised by John F. O'Rourke. In this type of caisson a drum of wooden staves was built up on angle rings, and had a plate and angle cutting edge. About 6 feet above the cutting-edge a special ring was placed, and to this was attached a removable steel air-deck to form a working-chamber, having steel shafting to connect to an air-lock above. In sinking, the annular space between the drum and shaft was filled with pig iron, and after sinking and sealing the working-chamber, the pig-iron, deck and shaft were removed, leaving a cofferdam which was then filled with concrete.

The sheeting of these caissons was 3½ x 8 inches long leaf yellow pine, bolted to 3 x 3 x ¼-inch angle rings with ½-inch carriage bolts. The working chamber section was caulked with oakum. The cutting edge was made up of a 12 x ⅜-inch vertical plate stiffened at the lower edge with a 3 x 3 x ⅝-inch angle. The cutting-edge was stopped in hardpan and the excavation taken down to rock. The concrete used had broken stone aggregate and was of good quality, although some of that in the working-chambers was found to be porous and had to be removed where an old caisson was incorporated in the new work. Sheeting, when removed, was in such good condition that some of it was used by the contractor for bracing and platforms.

WORK PUSHED 168 HOURS A WEEK

Up to the time of the completion of the interior pier excavation, the job was worked continuously, three shifts, seven days a week, and was ready for the setting of structural steel within five months after the start of foundation work on July 1, 1931. The work started at the time when approximately one-half of the lot was still occupied by buildings to be razed. In view of the unusual conditions of the work this time represents very good progress.

PERSONNEL

The architects having charge of the work for the owner are Shreve, Lamb and Harmon, New York. Purdy & Henderson Co. are the structural engineers. The Thompson-Starrett Co. Inc. is the general contractor and The Foundation Co. was the subcontractor for the entire foundation work. Chas. Scott Landers was consultant and supervising engineer on the foundation.

Concrete Highway Construction in 1931

THE year 1931 was an unparalleled year in road building both in contracts awarded and projects completed. During 1931 contracts let for concrete highways in the United States totaled 111,989,850 square yards, a gain of about 3.6 per cent over 1930 which was the best previous year. The following figures show the average for the five preceding years:

1930	108,008,062 square yards
1929	92,816,794 square yards
1928	93,531,487 square yards
1927	77,232,917 square yards
1926	64,978,458 square yards

Construction weather during 1931 was excellent and a larger percentage of contracts were completed during the year than usual. Approximately 116,000,000 square yards of concrete highway pavements were actually laid during the year, including some 26,600,000 square yards of uncompleted contracts carried over from 1930. Based on an 18-foot width, the pavement laid is equivalent to about 11,000 miles of road. In 1930 approximately 10,500 miles were completed.

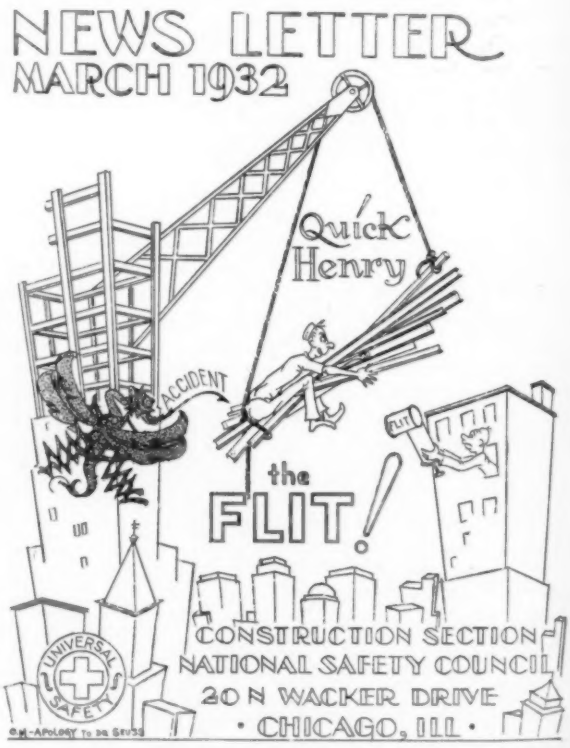
Illinois was the leading road builder among the states during 1931, being followed closely by Texas, Louisiana and New York. More than 10,000,000 square yards of concrete road contracts were awarded in each of the first three states mentioned, and over 9,000,000 in New York. Indiana, Iowa, Wisconsin, Michigan, Minnesota and Missouri each awarded contracts for more than 4,000,000 square yards of concrete roads.

Municipal paving declined considerably in 1931 from the peak of 1928. Awards for concrete streets and alleys during 1931 totaled 22,927,002 square yards as compared to 37,813,593 for 1930 and 54,655,647 for 1928, the highest year on record.

Over 9,000 Reports on Contractors

THE Bureau of Contract Information, Inc., 727 Fifteenth St., N.W., Washington, D. C., organized a little over two years ago has been successful in rendering over 9,000 individual reports on contracting concerns throughout the United States. This is a remarkable record in the interest of awarding contracts to responsible organizations. The services of the Bureau of Contract Information, Inc., are available to those who award construction contracts, namely architects, engineers and public officials and without charge but are sent in exchange for information received from them on contracts awarded as well as performance of contracts and notices of defaults and failures in the performance of contracts.

The Bureau has recently issued its Directory of Contractors for 1932, listing those organizations which have filed their performance records with the Bureau. This Directory is available to those responsible for the award of contracts.



SAFETY GOES HUMOROUS

With the permission of Stanco Inc., New York City, the Construction Section, National Safety Council, produced the above entertaining cover for its News Letter of March, 1932. Each copy of this News Letter is packed with pep, punch and ideas for construction men interested in fewer accidents and greater safety.

Tandem Paver Operation *in* Iowa

On an 18-Foot, 10-7-10-Inch Slab Tandem Pavers Made Unusual Progress with Automatic Control Between Pavers

WE have now come to full automatic control between tandem pavers so that the time constant that is bound to exist when the pavers are operated manually has been cut to the minimum. The pair of Koehring 27-E pavers which were used by the J. S. McLaughlin & Sons Co. of Des Moines, Iowa, on its 31-mile concrete paving job from Iowa City to Estherville close to the northern border of Iowa last summer were equipped so that the starting of the skip of No. 1 paver set a cycle of operations going. When No. 1 paver was discharging its batch, the skip was started up by the operator. This automatically shut off the discharge of the drum into the skip of No. 2 paver and started the discharge of No. 2 paver into the spreading bucket and, at the same time, started the raising of the skip of No. 2 paver. Thus a cycle of operations that usually required the careful watching of the operators of the two pavers was handled without any attention from them. Split seconds were saved which meant the saving of many minutes and consequently many more batches on the road during the 60-hour week that the Iowa State Highway Commission regulations permit for paving operations.

This accounts for several daily runs of 2,200 feet with 12 hours work at the paver. This meant considerably more than the standard mile-a-week boast of the one paver contracts. The contractors working in Iowa try to get in the 60 hours by Friday night so that the men can have the benefit of the longer week-end. If weather or breakdowns prevent this, the whole outfit works on Saturday until the 60-hour limit is reached.

On this job the grading was started on March 20, 1931, and the concreting on May 4. The contract date for completion was November 1 but actual concreting was finished late in September. Iowa builds but one type of concrete pavement, an 18-foot reinforced slab with a 2-inch parabolic crown. The thickness of the slab varies from 10 inches at the outer edge to 7 inches at a point 4 feet from the edge. The center 10 feet is uniformly 7 inches in thickness. The project to be described in this article was completed in the geological region known as the area of latest glacial drift.

One Crane Unloaded 20 Aggregate Cars a Day

All aggregate cars were received on one spur track while the cement cars were unloaded from two parallel spurs. The aggregate cars were spotted for the Northwest crane with a Caterpillar Thirty. A 42-foot boom made the swing easy for the 1¼-yard Blaw-Knox clamshell bucket. A large stockpile was maintained by the contractor against any possible failure of the railroad

to deliver sufficient aggregate for a whole day. Both sand and gravel were delivered in gondola cars from the plant of Concrete Materials Corp., Wallingford, Iowa. The Blaw-Knox two-compartment bin was covered with a bar grizzly and one man was on top of the bin all the time picking rags and sticks from the aggregates as they were placed by the crane. He was provided with a platform on the opposite side of the bin from the crane and was shielded from the sun by a frame covered with burlap. One man was used in the sand car and another in the gravel car being unloaded. Other operators not already mentioned were the crane man and the batcher operator. A typical batch was composed of the following actual weights, including moisture: 1,690 pounds of gravel, 1,440 pounds of sand, and 669 pounds of cement.

A Three-Car Cement Dock with Three Traps

All batch hauling was handled by the Western Gravel Co., Waterloo, Iowa, by subcontract using one-batch trucks including Chevrolet, Ford, and International trucks all equipped with dual pneumatic tires. After receiving the gravel and sand at the weighing batchers the trucks drove around the stockpiles of stone to the cement dock. The cement dock was U-shaped and located between two spur tracks. By running cement from two cars on one track and one on the other, the contractor was able to continue batching the cement even though the switching required that the two cement cars on the spur with the aggregate cars were pulled out entirely. The entire dock was double-planked to prevent the dropping of cement through any cracks, and was built in sections 16 feet in length with five bents per section. These could be easily handled when moving to another set-up. The run tracks were nailed down, completing a continuous platform when the new location was reached. The entire cement dock was torn down one afternoon, loaded onto freight cars, shipped to a new site during the night and at two o'clock the next afternoon the entire dock was ready for loading.

The runs to the freight cars were set up 9 feet from the center line of the track which necessitated rather long gangways. In handling the cement there were two men per car loading the Sterling concrete carts and three cars were worked at a time. Two wheelers picked up the carts as they were pushed out from the cars onto the runways and carried them to the Fairbanks scales. The weigher pushed them onto the scale, checked and corrected the weight and pushed them off. One dumper then pushed the cart to any one of the three traps which was empty at the time. The wheelers, as soon as they had left a cart at the scales, went to one of the traps where there was an empty and pushed it back to a car where a full cart was waiting. The beams of the scales were carefully boxed at the top to prevent the wind influencing the weight and to keep the cement from the scales as much as possible. Six Sterling concrete carts were used on the platform. One cover-up man on a small platform about 150 feet away from the cement dock on the driveway road covered the cement with the sand of the batch to prevent loss in transit.

To receive the cement on the batches of aggregate the trucks backed down a well-gravelled run excavated in front of the cement dock. They backed into one of the three traps which were well spaced across the front of the 38 x 14-foot dock. The ground was excavated so that when the truck wheels hit the bank the truck was in the proper position for receiving the cement. The truck body slightly hung over the bank which was excavated so that none of the rear end would be damaged.

The dumping traps were novel and well-conceived. A pair of tracks made from the old Ford frames were laid at the entrance to each trap with the outer flanges spread to make entrance of the cart wheels easier. The outer ends of the tracks were bent to the same radius as the cart wheels so that they stopped the wheels as the carts were wheeled into the traps. The traps were made of well-braced frames of 2 x 2-inch planed stock and covered with canvas. To protect the canvas from excessive wear the back of the trap against which the cement was dumped was protected with a sheet of galvanized iron. The base of the trap was hinged to the platform or dock about 8 inches from the edge so that when the trap was down the platform provided support for the trap which did not have to rest on the truck body. Further support was provided by the counterbalance cords which were knotted and a nail put through the knot at a point so that the nail would hit the pulley in the frame overhead and stop the trap at the right point. The weights were two cans of gravel for each trap and the sash cords were regulated in length so that the cans rested on the dock when the traps were raised the proper amount. This arrangement gave the men practically nothing to look after except the actual dumping of the cement.

A Firm Foundation for the Batching Plant

To furnish a firm foundation for the bin and the truck runway at the batching plant the contractor had first laid a mat of 3 x 12-inch x 18-foot timbers over which the specified 3 x 12-inch x 3-foot timbers were laid. The sills for the bin legs were 12 x 12-inch x 12-foot timbers.

Unusual Preparation of the Grade

It has become customary for contractors to consider that the fine grade work starts with the setting of the forms and includes the trimming of the grade between the forms to the specified contour. The McLaughlin organization put a Monarch 35 with a Caterpillar 9-foot blade and a Trojan rooter out in front of the form setters to see that the grade was in proper shape for quick, easy, final grading. The advantage of this was that the grade was wider ahead of the forms and the equipment could operate more quickly, turn more easily and cause less delay to the trucks. The Trojan rooter was used by this contractor because of the easy control of the rooter teeth through a wheel instead of the usual levers.

For a full 1,200 feet ahead of the paver the Heltzel 10-inch forms with an 8-inch base were set to line and grade. The form trench was cut with a 1931 Carr Formgrader with a Waukesha motor. A total of 7,000 feet of forms was kept moving on this job. There were two form setters and two helpers who worked continuously to keep the line of steel ahead of the rapidly moving paver team. Any high spots in the grade not sufficiently taken down by the advance graders were taken out by a pair of Perry No. 5 rotary scrapers

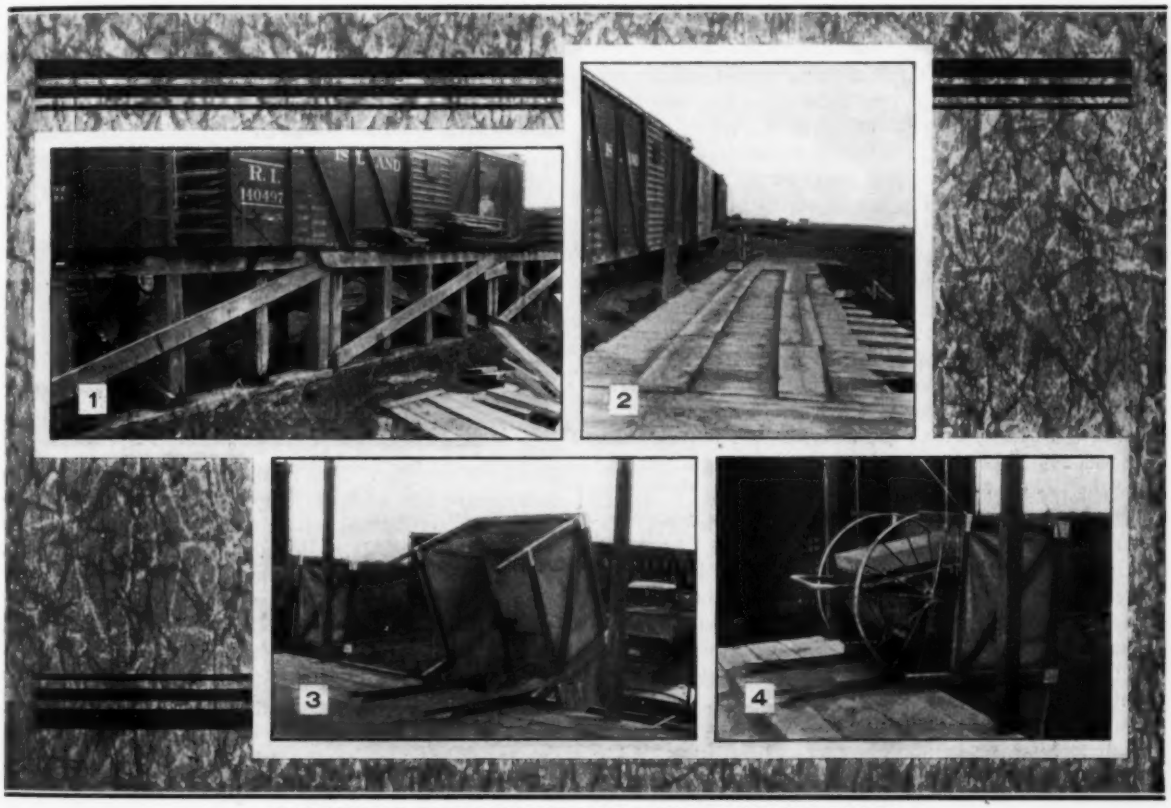
pulled ahead to cut the grade to final shape by one of the Monarchs, and then five men followed up to hand shovel any dirt from the windrows left by the subgrader. An Austin Pup rolled all the soft spots and any fills that had to be made because of low places in the grade. No scratch board was used on the subgrade to check it. All checking was done with a string and the ever handy notch on the shovel handle.

How the 2,200 Feet of Reinforced 18-Foot Slab Was Poured

On the well-prepared grade about 150 feet ahead of the pavers the Blaw-Knox turntable reversed each truck as it came along and started it on its crab-like journey to the paver skip. With only one-batch trucks the turntable man was running literally in circles, or at least half circles, all the time. Likewise the truck dumper at the skip of No. 1 paver was busy spotting a new truck every half-minute in every paver hour. No. 1 paver operator started the sequence of automatic operations described earlier in this article and watched to see that the batches were loaded into the paver as rapidly as the mixing time would permit. By not having to watch the other usual operations which require so much of the operator's attention he was able to speed the work and cut lost time to a minimum.

No. 1 paver pushed a profile cutter, an unusual but very useful tool. It reduced the amount of dirt handled at the scene of concreting and required the attention of but one man with occasional help of one of the men working regularly on the second profile cutter, a Carr Trail Grader, pulled by No. 2 paver. The man who cared for the dirt in front of the first profile cutter also handled the drip from the delivery chute of No. 1 paver as it discharged into the skip of No. 2 paver. A wooden drip box was provided so that the grout could be shoveled into the skip and not lost on the grade.

The two Koehring 27-E pavers were spaced with a steel tie bar onto which the skip of No. 2 paver dropped to receive its batch from the first paver. The second paver pulled the Carr subgrade planer from which the excess dirt was shoveled by the two trail graders. One or both of these men helped the man on the pusher profile cutter when the dirt piled up too fast because of high grade.



DETAILS OF THE CEMENT DOCK AND DUMPING TRAPS

1. *Close-up of the portable bents. Each bent is the length of one of the longitudinal diagonals.* 2. *A runway along the spur track, showing the plank tracks for the cement buggies.* 3. *A close-up of one of the three traps raised to release the batch truck. Note the channel guides for the buggy wheels and the metal straps at the corners of the frame.* 4. *A loaded buggy in the trap ready to be dumped.*

Under Iowa specifications the grade is not sprinkled but it is covered with tar building paper to prevent the absorption of the water in the concrete by the soil. Six rolls of building paper were laid out on the grade with one short or narrow roll at the edge. These were unrolled by one man as the paver advanced and before the steel was set by the three steel men.

The steel reinforcing for an Iowa concrete pavement consists of two ⅝-inch round bars or rods laid along the center of the pavement 9 inches on either side of the center line and one similar bar along the side 9

inches from the form and 2½ inches from the top of the slab. These constitute the longitudinal reinforcing except at the expansion joints. The tranverse reinforcing consists of 11-foot bars laid across the road and alternately placed, starting 6 inches from one form and then 6 inches from the other form. These are spaced 3 feet on centers. The center steel and the transverse bars are wired after placing.

At intervals of 60 feet ¾-inch expansion joints are set, using premoulded material. Dowel bars 2 feet long and 2 feet on centers are run through the expansion joint and wired to a 17-foot 6-inch transverse bar placed 6 inches from the joint on either side. The dowel bars have steel sleeves placed on the ends near the paver to provide expansion space after the slab is completed. At each expansion joint eight "hair pins" of ⅝-inch dowels 11 feet long bent to the familiar shape are set one at each corner and also at the corners formed by the longitudinal center slot. The expansion joints are set with a cap slotted to permit it to slide over the dowels. The joint is carried to the top of the pavement. All steel and the expansion joints were set by the steel men on this contract.

Three puddlers and two spaders handled the concrete as it poured in an almost continuous stream from the chute and bucket of the second paver. Finishing of the slab was allotted to one Ord finishing machine with two screeds. This machine pulled a Heltzel Cleft-Plane machine and one man riding it inserted the treated paper in the slot which was cut on the second pass of the machine over the new slab. The paper ribbon was 2½ inches wide and the men placing it finished over the ribbon with a hand float.

The steel men made up the expansion joints in an installing machine upside down. First the cap was placed in the machine, then the Elastite premoulded joint, followed by the dowels and the transverse bars, all of which were properly wired. Then light wires were tied around the joint to keep it in the machine when it was set up right side up. These wires were cut when the joint had been set in place and the concrete poured on both sides, so that the machine could be pulled out without disturbing the joint. The cap was left in place until the finishing of the slab was completed. When the concrete had set sufficiently to permit edging along the expansion joints, it was removed.

Following the Cleft-Plane machine was the double rolling bridge with the 12-foot longitudinal float worked by two men. The float was built up of 2 x 12-inch lumber and well braced to prevent warping. The float was run across the slab twice and then moved ahead half its length and the operation repeated. When the finishing machine operator came to an expansion joint he drove a stake in the shoulder close to the forms to indicate the location of the joint for the benefit of the joint finisher.

The longitudinal float was followed by two slab finishers who used the long-handled drag straight-edges 10 feet long, long-handled floats where necessary to touch up high or low spots, and then the 12-inch belt pulled over the slab. After this the finishers checked the slab for high and low spots with a checking straight-edge, and finding no such spots, immediately used the second 12-inch belt. They then edged the pavement on both sides.

The joint finisher working from a rolling bridge spotted the stakes placed by the finishing machine operator and pulled the caps on the joints and edged them with a tool made from an 8 x 3-inch trowel with one side turned down on a 3-inch radius for edging the joint. Two men working from a bridge spread the burlap and then as many as five sprinklers kept the burlap wet for the required period.

The Earth Cover Team

The earth cover crew was in a class by itself with sleeveless jerseys of gray with the name of the company in red letters across the back. These were not supplied by the contractor but were very likely the result of some judicious high-pressure selling on the part of one of the local clothing houses. There were twelve men pulling forms and covering the 24-hour old slab with earth. These men were assisted by a team, driver and helper with a plow in loosening the earth along the shoulder for the cover. This same team and another with flat bed wagons brought up the forms and burlap. The dirt cover was 2 inches thick and was sprinkled for seven days by a crew of nine men. When the curing period was over the earth was removed by a light tractor pulling a patrol grader.

Running Lip Curb

When lip curb was run two builders and two helpers were used. The concrete was shoveled into wheelbarrows spotted along the shoulder 10 feet apart by the spaders and when a barrow was empty it was pushed back by the helper. This is much more sensible than to make a man break his back trying to push a loaded barrow along a rough shoulder every few minutes. The lip curb in Iowa is uniformly 3 inches high and 12 inches wide. On this job it was built up by using Heltzel 3-inch forms held firmly on the road forms by clamps.

Pavement Straight-Edged the Second Day

The second day just before the earth cover was placed the slab was straight-edged with an aluminum straight-edge to locate high spots. When any were found they were cut off with a shovel. When they were large enough to cover several square feet the men developed a technique that made it possible to cut them very quickly. The square-edged shovels were placed back to back and two men vigorously pushed them back and forth and the hump disappeared remarkably quickly. Any places that had set up too hard to be cut with the shovels were rubbed down by hand with a carborundum brick.

Booster Pump on Water Supply

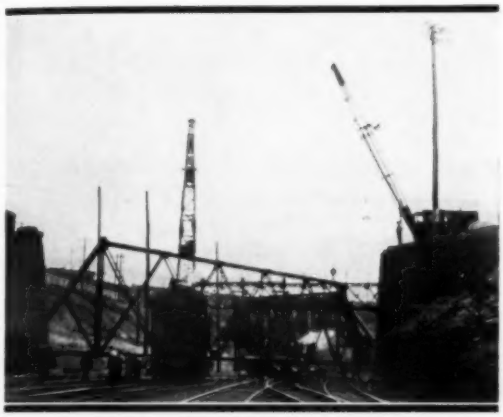
Two C H & E triplex No. 11 pumps were used to furnish the water for the paver and sprinkling. On the longest line one of the pumps was used as a booster. Both 3-inch and 2½-inch pipe was used. When the booster was used the 3-inch line discharged into a 1,000-gallon galvanized stock-watering tank and the booster took its suction from the tank.

Taps for the paver hose were set at intervals of 200 feet and the paver carried two 200-foot 1½-inch hose. A T connection with two valves on the paver made it

(*Continued on page* 39)

The Old Makes Way *for the* New

Steel Truss Bridge Across Erie Railroad Main Line Tracks Removed. Then New Concrete Piers Poured During the Winter



Removing the Second Truss

REMOVAL of two 130-foot steel truss spans at the Tonnele Avenue crossing of US Route 1 and the Erie Railroad in Jersey City, N. J., provided a neat problem for the contractor. Everything done where a railroad is concerned must be run on schedule with a penalty usually attached. In this case the two trusses had to be removed between trains. The first pair over the main line tracks were cut with K-G and Smith acetylene outfits, and so attached to the two cranes that the 12-ton load was divided into 8 and 4-ton loads in proportion to the capacity of the cranes.

When the first truss was cut nearly through the acetylene operator was called off the truss, and shortly after the two pieces separated readily, and an Industrial-Brownhoist 75 locomotive crane swung the 8-ton section onto a flat car for further cutting up and removal, and a second Industrial-Brownhoist crawler crane on the bank swung the 4-ton section clear. The first truss of this pair was removed between trains in 18 minutes and the second in 28 minutes. The plate girders over the freight tracks also weighed 12 tons each, but because the tracks could be used for two hours at a time the girders were taken off and burned on the tracks. The larger locomotive crane handled this work alone as the reach of the boom was greatly lessened.

Footing for the New Pier

Following the removal of the trusses and girders it was a short job to demolish the old masonry pier that had supported them. Immediately work was started on the excavation for the footing of the new concrete pier. This work was carried on during January and February, 1931, with the temperature slowly dropping, necessitating the consideration of protection for the concrete. As the ground water was high in this section it was necessary to put in a row of Moretrench well points and two Moretrench combination pumps to lower the water level. These operated successfully and all of the excavation was handled in the dry. The foundation was carried to a depth of 10 feet, and was 17 feet wide and 104 feet long. The center pier carried on this foundation is 5 feet wide at the top and 23 feet high.

The footing ran so close to the passenger tracks on one side and the freight tracks on the other side that it was necessary to cut the ties close to the rails so that the light-weight Lackawanna steel sheet piling could be driven to protect the excavation.

Winter Concreting

The wood forms for the pier were well built, braced and completely tied with bolts and rods. To protect the forms after the concrete was poured and to provide sufficient space for equipment to heat the mass, the contractors would have preferred to build a framework about the forms, but this was impossible because of the small clearance with the passing trains. The forms were completely covered with tarpaulins, and four salamanders and a steam line from the crane were used to provide heat until the concrete had set for seven days. Although the outside temperature dropped to 8 degrees

at one time during the setting of the concrete there was no damage to the pier, which is a particularly fine appearing piece of work with practically none of the form marks showing after a small amount of rubbing.

The batching plant and mixer were located on the north side of the work where a spur track made it possible to spot the aggregate cars. Sand was received from the Suffern, N. Y., plant of Ward Brothers, and the stone from a local crushing plant which is still engaged in crushing the stone from the famous Erie Cut in Jersey City which is spanned by the new bridge. The sand and stone were unloaded by the Industrial-Brownhoist locomotive crane, using a 1-yard Williams bucket. The stone was stockpiled or loaded directly into the Blaw-Knox bins. The sand was loaded direct to the bins. A sufficient quantity of extra stone was stockpiled to care for the pouring of the northerly retaining wall for the abutment of the bridge.

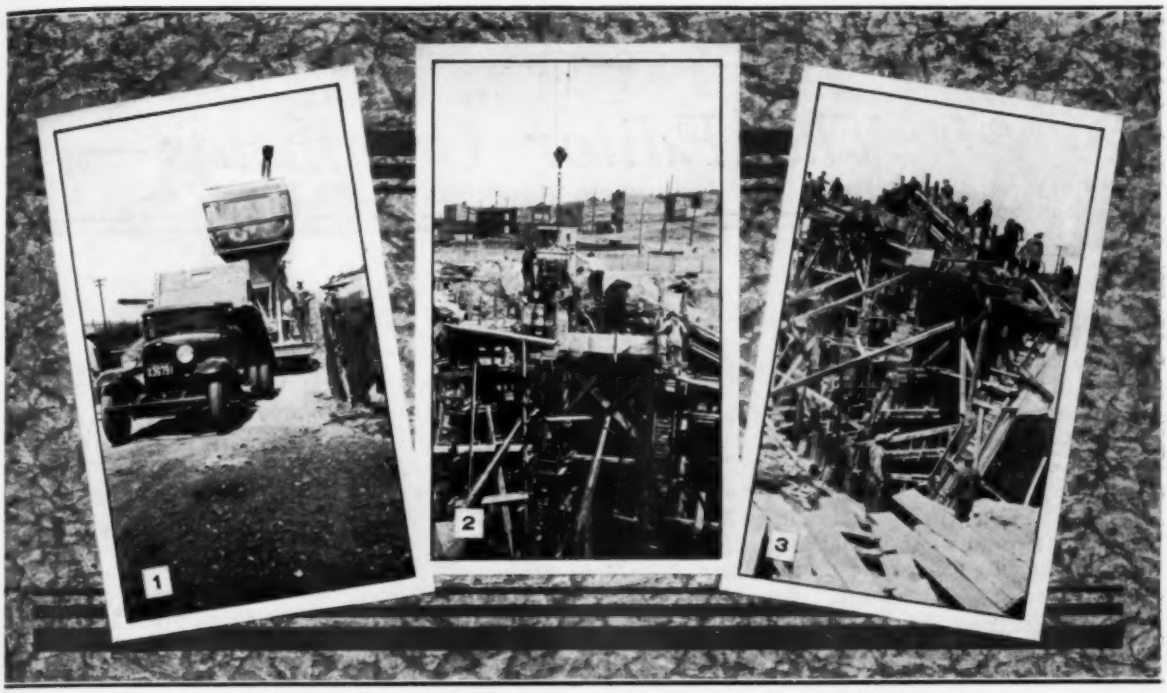
A batch which approximated a 1:2:4 mix was weighed out in the Blaw-Knox batchers and mixed for 1½ minutes in the Ransome 28-S mixer. The completed concrete was delivered to Stuebner concrete buckets carried on industrial railway flat cars and hauled out by a 5-ton Whitcomb gasoline locomotive. The track was laid in the space between the northerly freight track and the old north abutment with a minimum of clearance. The buckets were lifted from the cars by an Osgood steam shovel equipped with a 60-foot boom, as it was necessary to set up the shovel on the bank and span the two freight tracks to deliver the concrete to the pier forms.

THE SOUTHERLY RETAINING WALL

The old abutment on the south side of the cut was of rubble masonry and easily demolished. The footings for the new retaining wall extended out under the first track which handles all the incoming main lines trains of the Erie Railroad. It was necessary to construct a trestle to accommodate the footing. This was done on two successive Sundays when the commuter traffic was nil and the through trains at a minimum. On the first Sunday that work was done on this trestle a downpour nearly flooded out the work. Pumping out the water delayed the work to such an extent that several extra

SOME OF THE CONCRETING EQUIPMENT, THE NEW CENTER PIER AND DEMOLITION OF THE OLD CONCRETE RETAINING WALL

1. The aggregate bins and the locomotive crane which stocked them. 2. The completed center pier which was poured during the winter. 3. The 5-ton gasoline locomotive which hauled the batches out on a narrow gage track squeezed between the freight track and the north abutment. 4. The steam shovel which did the excavating back of the north abutment and which helped to pull down the concrete as it was blasted out. 5. Another big slab pulled out ready to load on a truck.



CONCRETING OPERATIONS ON THE NEW SOUTH ABUTMENT

1. One of the fleet of two-batch trucks with dual pneumatics which hauled the proportioned batches to the paver. 2. The 1-yard bucket which carried the concrete from the paver to the forms. 3. The easterly end of the south abutment showing the men vibrating the forms with pneumatic hammers and spading the concrete against the forms.

hours were required to finish. For the cut-off walls for the entire length of this section and along the edge of the large cemetery at the top of the wall Larssen steel sheet piling in 24-foot lengths was driven to retain the earth back of the excavation.

Some trouble was experienced with ground water during this excavation and well points were put down to dry out the pit. On the Saturday preceding Easter Sunday the work seemed hopeless until six Moretrench well points were put down at strategic places in addition to the first group, and by four o'clock Sunday afternoon the excavation was dry to a foot below the deepest footing.

Concrete for the southerly retaining wall was mixed in a Ransome 21-E paver and discharged directly into Stuebner buckets which were swung over the forms by a stiffleg derrick operated by a 3-drum Lidgerwood hoist. For one section the Industrial-Brownhoist gasoline crawler crane was called into service to handle the concrete buckets beyond the reach of the derrick.

The aggregate for the concrete on this side was brought to the paver already batched by two dual pneumatic Ford 2-batch trucks with Wood bodies and hydraulic hoists.

The forms for the southerly retaining wall, which measures only 18 inches wide at the top and 24 inches wide at the bottom, were literally filled with reinforcing steel because of the counterforts and the thinness of the wall. In order to insure the close contact of the dry concrete and steel in this high and thin section the forms were vibrated with chipping hammers throughout the pouring.

PERSONNEL

This work was done for the State Highway Commission and the Erie Railroad under a contract awarded by the railroad, George S. Fanning, Chief Engineer; C. H. Splitstone, Superintendent of Construction, and A. B. Fowler, Resident Engineer. The contractor was Parker & Graham, New York City, for whom F. B. Matthews was Superintendent.

Tandem Paver Operation in Iowa

(Continued from page 36)

possible to shift the hose without losing a second of mixing time. New York Belting & Packing Co. hose was used with heavy connections.

THE GASOLINE SUPPLY

All the equipment owned by the contractor was supplied with gasoline at noon and at night by a truck from the local distributing point of the Champlin Refining Co.

PERSONNEL

This well-run paving job, Project P-702, was completed by the J. S. McLaughlin & Sons Co. of Des Moines, Iowa, with Earl Momyer as Superintendent. For the Iowa State Highway Commission, W. I. Paylor was Resident Engineer.

What Are You Interested In?

The May issue of CONTRACTORS AND ENGINEERS MONTHLY *will contain articles on the cost of power-driven elevating grader operation; the use of a paver to pour a long culvert; and the well point system and freezing method of driving shafts used in the vehicular tunnel at Antwerp, Belgium.*

The Editor Comments—

The Skies Are Brightening

It is a very great pleasure to be able to report to our readers that we are receiving concrete evidences of improvement in business conditions. The latest and perhaps the most encouraging is that of the Twin Disc Clutch Co. which reports its customer list increased 31 per cent during 1931. P. B. Batten, President of that company, predicts an early upturn in business and then makes a statement which should interest business men, whether they be contractors or manufacturers. Mr. Batten says:

"A depression remains an enduring problem only to those companies who are unable to organize themselves to render greater service or answer the greater needs in better ways. Early in 1931, we realized the depression was, when rightly viewed, an opportunity to us. We concentrated advertising and sales effort upon new product engineering and redesign. We expanded our engineering facilities and brought them into closer liaison with the sales department. The result—a gain of 130 customers which, under normal conditions, we might have found it difficult to interest. Many companies are finding that they can escape from the present economic predicament by diversification or by redesigning products to give greater values at less cost. In either case, it means redesign. By working with such companies, our sales and engineering departments have been able to answer an emphasized need so efficiently that our future is very bright indeed."

Not "muddling through" but planned foresight!

The Decrease in Highway Construction Costs

State, counties and towns can now buy their roads about 26 per cent lower than the average cost for the five-year period 1925-29 or about 45 per cent lower than the peak cost for 1924. Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads, discussed the efficiency of road construction before the American Road Builders' Association in January. He has given full credit to contractors and manufacturers for the increased efficiency in highway construction which has been one of the important factors in reducing prices.

Mr. MacDonald states, "The improvement in engineering designs, in contractors' methods, in efficiency and adaptability of equipment, which resulted over the period of five years from 1924 to 1929, is a constantly decreasing index of road costs before there was any effect from the present depression. The decrease in road costs for the five-year period from 1924 to 1929, taken from unit prices of Federal Aid projects, was about 27 per cent. During this same period, there was a constant increase in the quality of the roads produced generally. The road contractors and equipment manufacturers are to be credited with a large part of this decreased cost, through improved organization and better methods, which permitted higher production with the same organization cost. Better engineering designs, better inspection, and a pride in their output on the part of both contractors and engineers, produced at a constantly decreasing cost a constantly better quality and more durable roads. The composite prices for 1931 have been about 26 per cent below the average cost for the five-year period 1925-1929. This latter reduction has to a large extent been due to lower prices for materials and to some extent lower prices for labor; but the general road costs which are now around 45 per cent lower than the peak costs for 1924 would not have been possible without the improved production methods and equipment and better engineering practices which have been developed."

Buy Your Gasoline Delivered

It has been my privilege to visit, study and describe over 320 construction projects in most of the 48 states during the last four years. This has naturally led to the discovery of certain practices leading to economy and smoothness of operation. Among these practices, particularly in the middle west, is the growing use of the service offered by large gasoline producers and some independent producers in refueling equipment at stated intervals.

In the south and east, some contractors send their trucks to a local gasoline station for refueling and haul 5 and 10-gallon drums of gasoline to the equipment on the job. More frequently, however, a contractor installs a 500-gallon tank at his batching plant or material yard with a measuring pump and supplies the equipment from that point. The tank is filled from a producer's truck at regular intervals.

Better than either of these methods is that developed in the middle west where a contract is made with a gasoline company to "gas" all equipment for the duration of the job. The gas truck visits all equipment regularly each day, usually during the noon hour and at the end of the day, filling every fuel tank and having the driver or operator sign for the amount of fuel delivered. This saves an extra man who would necessarily have to drive over the job to refuel part of the equipment anyway, prevents cluttering the material yard with trucks returning at odd hours for fueling and eliminates delays caused by equipment running out of gas during working hours.

Theodore Reed Kendall

Pipe Line Trench Excavation *with* Explosives

By
A. L. Nixon

Drilling Holes in the Rocky Bed of the Susquehanna River Near Harrisburg, Pa., Preparatory to Blasting a Pipe Line Trench 3,600 Feet Long Across This Waterway

High Explosives Are Indispensable in Constructing Trenches Quickly and Economically

DURING the past twelve months more than 15,000 miles of pipe lines were laid in the United States to convey water, oil, natural gas and gasoline. Considering that these pipes varied in diameter from 4 to 36 inches and that they were buried underground from 2 to 6 feet deep, you can readily understand that these construction companies have removed and replaced an immense tonnage of earth and rock.

They have found that it is much cheaper to lay out rights of way direct to a destination than to detour around mountains, swamps and rivers, and that is why explosives have played an increasingly important part in their work.

Dynamite has been used to blast out stumps and level rocky surfaces along rights of way before moving up the heavy construction equipment. These areas range from 20 to 30 feet in width and in many cases, when the gang has completed its clearing work, the right of way is as serviceable as a country road.

Where streams or rivers controlled by the Government have to be crossed, the pipes must be buried from 2 to 5 feet below the natural river bed. Most concerns know from experience that if this is not done, débris floating downstream is likely to attach itself to the pipe with disastrous consequences. In some instances pipe lines have been carried away. So it has been a common practice to use dredges and other equipment to make trenches across river beds and to lay the pipes in them. Then the sediment in the river gradually fills up the excavation, forming a natural protection. But dredging is expensive and is attended with many difficulties.

On this account pipe line companies were keen to accept the suggestion that this work could be done more quickly and economically by blasting these trenches with dynamite. More than fifty river crossings, ranging from 50 to 3,600 feet in length, have been made with explosives, which have been put to work under water sometimes as deep as 20 feet. Each crossing has presented its own problems and in solving them several kinds of dynamite and some unique blasting practices have been employed.

CROSSING THE TRINITY RIVER IN TEXAS

Probably the most unusual case was the job of laying pipe lines across the Trinity River in Texas. This waterway, which has been crossed seven times by pipe line crews, is less than 200 feet wide, but, in some places, it is more than 30 feet deep and the water is so discolored that one cannot see the river bottom. Before attempting to use dynamite, the men had to know what materials would be encountered. They probed the bottom along the entire right of way and found hundreds of "deadheads" and snags deeply imbedded in the mud, as well as rocks and other obstructions.

First, these rocks were drilled and shot. Then bombs, made up of bundles of dynamite, were placed and shot to dislodge the water-soaked stumps and logs. Finally came the task of shooting the trench. A special plan was developed to meet these deep-water conditions. For lack of a better name it has been called the "string-shot" method.

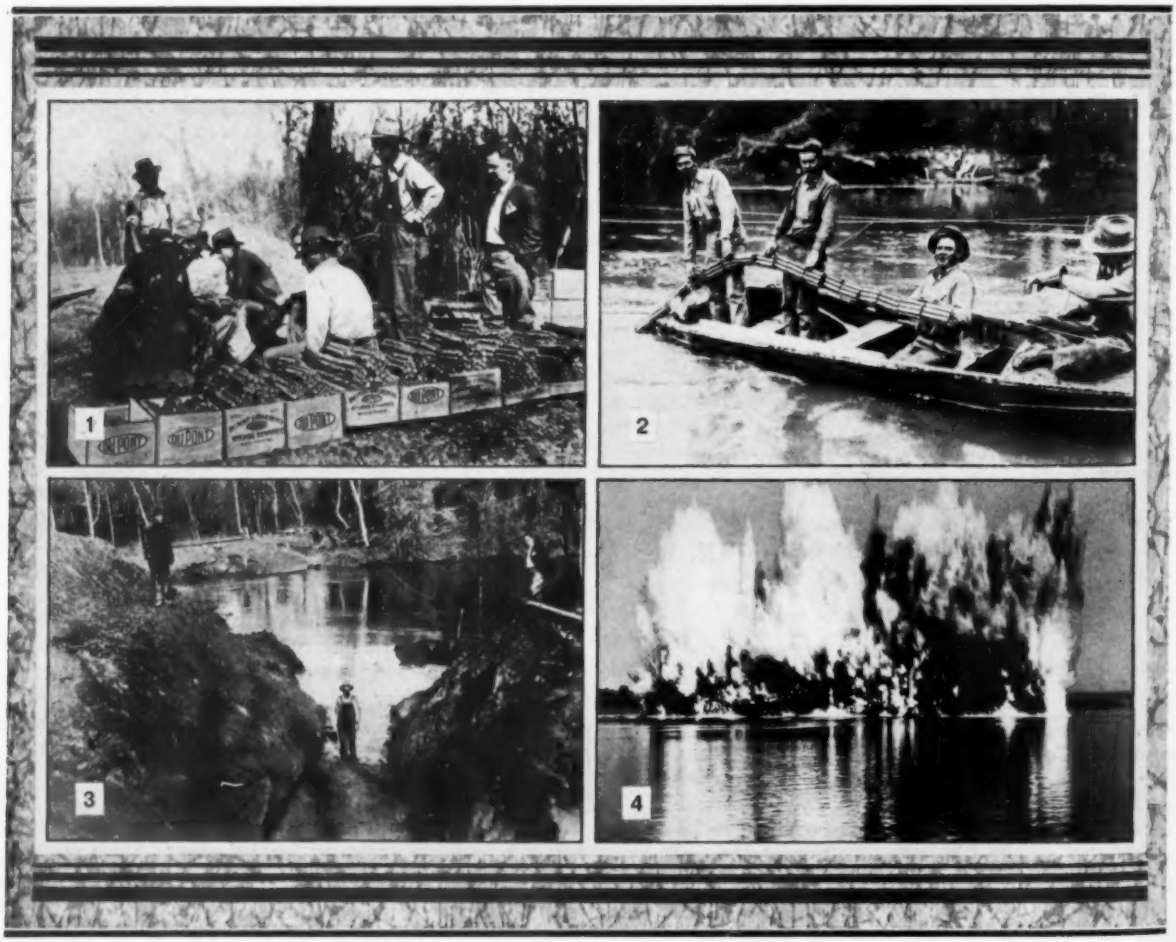
MAKING A "STRING SHOT"

Briefly, this involves stretching a cable across the river directly over the line of the proposed trench. To this cable bundles of dynamite are attached, end to end, and at intervals of every few feet small boulders are also tied on for additional weight, so that when the "string of dynamite" is prepared, it can be lowered straight down to the desired position in the river bed, without being deflected by the current. This accomplished, the shot is fired with the result that a trench of sufficient size is excavated and the pipe is easily and quickly placed in it by means of a tractor and cable.

CUTTING TRENCHES IN HIGH RIVER BANKS

Incidental to river-crossing work is the task of making trenches through high river banks, so that the pipes can be laid on a gradual slope down to the water's edge. Cutting through such banks by hand or with horse-drawn tools is both laborious and time consuming. Now, pipe line crews use dynamite instead, because they can accomplish more in a few hours than could be done in several days by old-time methods.

But such barriers to progress are as nothing compared to those found in swampy regions where it is almost impossible to dig trenches by hand, and other equipment is very expensive to use. In many cases attempts have been made to lay pipe lines through such



DYNAMITE AT WORK IN PIPE LINE TRENCH EXCAVATION

1. *Bundling dynamite to prepare a "string shot."* 2. *Placing a cable to which bundles of dynamite are attached.* 3. *A completed trench which was blasted for a pipe line across a small Southern river.* 4. *This spectacular shot on a* 350-*foot section resulted in a trench* 3 *feet deep.*

areas by ordinary methods, but slow progress has delayed the entire operation.

CLEARING SWAMPS FOR PIPE LINES

A most helpful service was rendered to the pipe line companies when it was demonstrated that dynamite could blast trenches through swampy land, quickly and economically. Briefly, the method consists of clearing the right of way and then, along the proposed ditch line, punching and loading the holes in a long row. One charge is primed with an electric blasting cap and when it is set off, all the others are likewise detonated with almost instantaneous effect. Water, muck, fragments of logs and stumps are thrown hundreds of feet into the air where the material spreads and falls on both sides of the finished ditch. Little or no work is required before the pipe can be placed in it.

Sometimes it is desirable to prepare a shot so that some material will be left for backfilling. A slightly modified system of loading will permit of replacing 75 per cent, if necessary.

Illustrations: courtesy of E. I. du Pont de Nemours & Co., Inc.

The Road Over Murder Hill

(Continued from page 20)

than 50 feet between the penetration and the seal coat, the top course was filled with No. 2 and No. 1 stone of ¾ to 1½-inch and ⅜ to ¾-inch screen sizes respectively by hand casting with a gang of about fifteen men. Then the seal coat of ¾-gallon per square yard was applied at the same temperature and the top covered with No. 1 stone. Each successive operation was followed by rolling with one or more of the fleet of 10-ton rollers, including a Buffalo-Springfield gas and another steam of the same make, a Galion gas roller, and a rebuilt Acme roller.

In handling the asphalt the tank cars at the two ends of the work were heated by a vertical steam boiler and the material hauled and applied by two Etnyre distributors. In order to insure clean joints at the beginning of each truckload a trough was placed on the road to catch the first flush from the distributor heads. Each roller on the penetration work was equipped with steel brooms at the back to evenly distribute the fines as the rolling progressed.

An Adams No. 11 motor grader was used to grade the shoulders at the end of the paving and was also used to cut the grade just prior to the spreading of the bottom course of slag.

DRAINAGE STRUCTURES

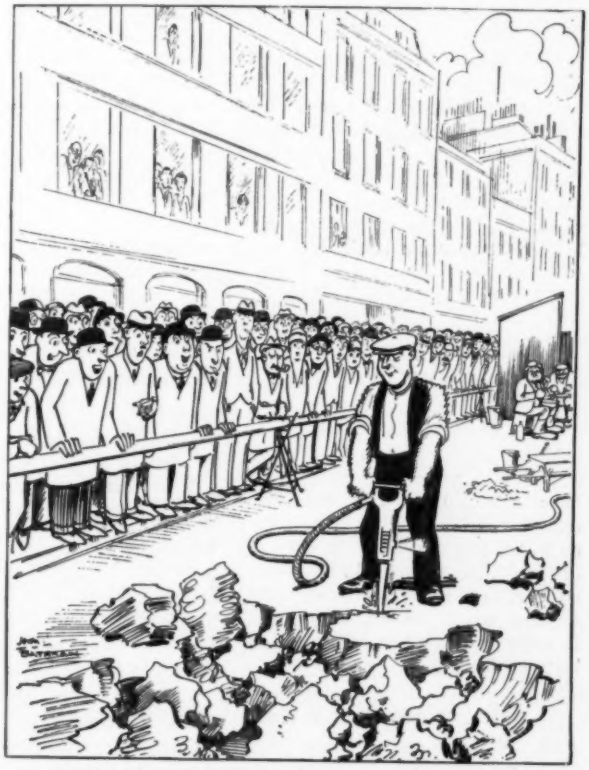
There were 5 miles of tile underdrain on this job and 5 miles of concrete gutter. There were also five bridges of varying spans, the largest being 45 feet. There were numerous culverts all but four of which were concrete or cast iron pipe.

QUANTITIES

A total of 8,500 yards of slag and 6,000 yards of No. 3 crushed stone filled with No. 1 and No. 2 crushed stone were used. These quantities with the 24,000 yards of gravel and the total of 100,180 yards of unclassified excavation show the magnitude of the work.

PERSONNEL

This contract which was awarded for $282,990.50 was completed by Sweeney & Boland of Rochester, N. Y., early in September, 1931. The contracting organization consists of Michael E. Sweeney and Patrick T. Boland, the latter acting as Superintendent throughout the work. The work was performed under the direction of Charles R. Waters, District Engineer of the Buffalo office of the New York State Department of Public Works, Division of Highways, with J. J. Raymond, Resident Engineer, assisted by R. W. Oakes, D. M. Rhodes and R. A. Powers.



The Man Who Worked Through His Lunch Hour Rather Than Disappoint His Public

From "Brought Forward" by H. M. Bateman, Internationally Recognized Caricaturist

The Travels of an American Engineer

A POSTHUMOUS book, "Keep Moving" by the late Alfred C. B. Fletcher, has recently been published by Laidlaw Bros., 320 E. 21st St., Chicago, Ill. Mr. Fletcher was a remarkable character, typical of the restless pioneer spirit of the early American. He literally toured the world, in the early days chiefly for his own entertainment and edification. Embarking from New York he went to Southampton and thence to London, followed by traveling to England and later to Antwerp and Rotterdam. The description of a German Christmas in France during war times is interesting reading. Then he came back to the United States for a short time and immediately left for Japan, China, Java, Sumatra and returned home through Europe. At the time of his death aboard the S. S. Vestris in November, 1928, he was on his way to South America in the export service of one of our largest manufacturers of construction machinery. His travels are entertainingly set forth in this book which is well illustrated with wood cuts. The price of this book is $2.50.

How the Other Fellow Did It

Construction Briefs

Value of Duplicate Batchers

146. Few contractors would probably think that a second set of batchers for aggregate on a road job would pay its way. An interesting instance where the second set saved the cost of several additional batch trucks was noted on a Connecticut project. The real reason that the contractor installed the second set was that he had a side hill bin into which the aggregate was delivered direct from the hopper bottom freight cars. The second pair of batchers had been used on another project and the cost of installation was very small. Only one regular batcher man was employed but a handy man who worked around the plant cleaning up operated the second set of batchers when they were needed. In the morning when the trucks, which were hired, bunched up at the batching plant, both sets of batchers were used. Whenever two trucks arrived at the plant very close together the second pair of batchers were again used. This made possible the hiring of fewer trucks as there was never any delay at the batchers and no idle trucks waiting to load. 21.6.50

Not a Bad Idea in Cold Weather

147. In a recent issue of "Operators Stabilizer" published by the Lincoln Electric Co., a welding operator from Akron, Ohio, sent the following sketch with this comment, "If you use cable No. 0 or No. 00, coil the cable in this manner, then sit on same and see how warm you can keep. In order to obtain best results, keep welding."

Make the Coil This Way

Safety First with Gasoline

148. Fifty-five-gallon drums of gasoline on the grade are potential trouble. One contractor overcame this by bringing out all gasoline for the paver and finishing machines in 5-gallon cans, instead of large drums. The experience of this contractor and many others is that gas on the grade is a source of danger if a couple of husky laborers take it into their heads to pour directly from the drums into the paver gas tank. A slip of the drum and there is liable to be a disastrous fire. 21.5.67

Steel Road Forms

149. The steel forms which are sent out to a concrete road job today are built to stand the most severe usage. They are called upon to carry the heavy loads of subgraders and finishing machines but they are not built as reinforcing for concrete which may be spilled on them from the road slab. Many a time laborers have been seen strenuously wielding sledge hammers trying to knock off concrete from old forms. The need for this can be obviated if occasionally the man who oils the forms on the inside applies a little extra oil over the edge and also if the men who finally line up the forms or tamp them spade a little dirt onto the base. Then, if there is any careless spilling of concrete from the slab, it will merely drop off when the forms are pulled. Remember this and make your forms last longer. 21.6.52

The Final Burlap Finish

150. What is commonly called the burlap belt by many contractors and which is used to give a slightly rough final finish to the concrete slab after it has been checked with a 10-foot straight-edge, is usually nothing more than a piece of burlap dragged along the surface by the two finishers. One contractor improved on the rough-and-ready type of burlap belt by attaching the burlap to a 2 x 4 which spanned the entire slab, the ends of which were trimmed to make handles easy for the men to grasp, and which remained reasonably free of concrete. By attaching the burlap uniformly across the 2 x 4 a very regular roughing was given to the pavement instead of the more or less streaked finish which results when a loose piece of burlap is merely dragged ahead by two men. 22.1.64

Coordinating Drilling, Blasting and Mucking

151. In the main, the removal of rock after blasting in a tunnel is the key to rapid driving. It is no use trying to pull a very deep round if the rock can not be removed and the next round drilled by the time set for blasting in the cycle of operations. In 8 x 8-foot or 9 x 9-foot headings used for pilot and pioneer tunnels, this question is very simple as one heading is being drilled while the other is being cleaned up. Where a single tunnel is driven, various schemes may be resorted to. In easily blasted ground, the problem is sometimes handled by having two drill shifts and three mucking shifts. Sometimes when the heading is carried full face, a bar can be set up near the top as soon as the men return to the face after blasting and the upper part of the face can be drilled from the top of the rock pile while the rock is being removed behind and below.

Where all the rock is shoveled by hand, it speeds up the work to load the lifter shots as heavily as possible and shoot them the last of the round. These holes then perform the two-fold purpose of breaking their burden to maintain grade and of throwing as much as possible of the rock pile back from the face so that the shovelers can get the space cleaned out in the minimum time ready for the drilling crew to bring up their equipment and start work.

Mechanical loaders work best when the broken rock is left piled up against the face. To secure this result in a full face 8 x 8-foot heading, the lifters should be fired simultaneously with the side and top holes. In a larger heading which is being carried full face, the lifters should be blasted as early as possible in the sequence of shots and the top holes last. If the tunnel is being driven by the heading and bench method, the bench can be quickly cleaned up by hand shoveling and the heading drilled while the mechanical loader removes the broken material from in front of the men. In this system the cut should be carried clear to the floor of the heading. While this makes the cut a little tighter and requires a little more explosive, more rock is thrown clear of the bench and this reduces the amount of hand labor. To prevent the rock broken by the cut blast from being thrown a long distance down the tunnel and spread in a thin layer which will be slow and expensive to clean up, it is a good scheme to have the bench drilled with lifters and blast the top line of lifters with instantaneous electric blasting caps at the same time as the cut. The rock coming from below then meets that thrown out by the cut and keeps this from being thrown any great distance back from the face. 21.3.100

The Consulting Engineer

A College Sewage Disposal Plant

Designed by

Wiley & Wilson

Lynchburg, Va.

THE installation of a new sewerage system and sewage disposal plant for Hollins College, the oldest chartered college for women in Virginia, located 8 miles north of Roanoke, Va., on the Lee Highway, was recently planned and supervised by WILEY & WILSON, Consulting Engineers of Richmond and Lynchburg, Va. Until the installation of the new sewerage system, the majority of the college sewage flowed without treatment directly into Carvins Creek, a tributary of the Roanoke River. Several of the outlying buildings were served by small cesspools which had to be pumped out two or three times a year. The serious drought of 1930 created a considerable problem as the sewage in the creek was equal to or greater than the stream flow. With these facts in mind and the possibility of a drought in 1931 creating even worse conditions, the consultants made a survey and report on the sanitary situation with a recommendation of necessary sewage treatment methods and for the location of the plant.

The site selected is approximately 900 feet from the nearest college building and is on a hillside to the rear of an old B. & O. R.R. fill to the west of the Lee Highway. The pumping station is located on the north bank of Carvins Creek about 500 feet from the campus. Sewage reaches this point through an 8-inch trunk sewer which carries all the sewage from the institution. A duplex installation of pneumatic sewage ejectors, each having a capacity of 100 gpm, is located in a pit within the concrete and brick pumping station.

The sewage is pumped through an 8-inch cast iron main laid under Carvins Creek and thence underground to the plant, discharging directly onto sloping bar screens for the removal of sticks, fruit skins, rags and other coarse material. The screened sewage then passes into the sedimentation chamber of the Imhoff tank. Two sets of baffles and a scum board at the outlet give a well-clarified effluent. The solids settle through slots at the bottom of the sloping walls into the sludge chamber below, providing 2¾ cubic feet of sludge storage per capita. The gases rise to vents at the sides of the tank which are equipped with water-sealed removable gas collectors. The gas will be piped to a burner or to a heater within the chlorine house. Gas floated scum is held below the water under the gas hoods by removable screens. The sedimentation chamber has a concrete cover with steel plate access openings through which the sloping walls may be cleaned. The tank effluent flows into a dosing tank equipped with a low draft siphon, there being only 18 inches difference between the maximum flow line in the siphon chamber and the surface of filter media.

The siphon discharges into a revolving sewage distributor, consisting of a fixed central vertical shaft about which revolves the distributor arms suspended from the top of the shaft and resting on ball bearings and guides. The bottom casing around the shaft is divided into two vertical circular chambers into which are suspended the two revolving chambers separating the inner and outer fixed ones by an air lock, thus preventing the overflow of sewage and providing a frictionless seal. The sewage flows in at the bottom of the center chamber up through ports into the four horizontal distributor arms which discharge the liquid through jets 6 inches above the filter stone. The jet action thus produced provides the power for revolving the distributor. As the distributor rotates the sewage is spread in a thin film uniformly over the surface of the bed.

The distributed sewage filters through 6 feet of 1½ to 3-inch limestone, from which all fine stone and dirt has been removed, to an underdrain system of terra cotta tile resting on a concrete floor. This effluent drains to a center well before flowing to the final sedimentation tank. The walls of the filter bed are of concrete. The final sedimentation tank is of concrete with a hopper bottom for sludge collection. A skimming board just ahead of the overflow weir removes the effluent in a thin film free of scum. The Imhoff and final tanks each provide 1¾ hours sedimentation period. The sludge from the Imhoff tank and final tank can be drawn by

(*Continued on page 47*)

A General View of the Sewage Treatment Plant Looking Toward the College

Consulting Briefs

Howard E. Simpson, University Station, Grand Forks, N. D., reports that he has recently completed a field survey and report for the improved and enlarged water supply for the State Tuberculosis Sanatorium at Sanator, S. D.

Klug & Smith Co., 111 E. Wisconsin Ave., Milwaukee, Wis., report that they have recently completed plans for the Monroe Avenue bascule bridge over the East River, Green Bay, Wis., the contract for which has been awarded.

Burns & McDonnell, Consulting Engineers, Kansas City, Mo., have recently prepared a 70-page booklet which gives the light and power rates, valuation of property, operating expenses, earnings and other conditions pertaining to 100 municipally-owned light and power plants. A rate reduction process is going on throughout the country in all utilities and it was felt that it would be interesting to know what rates municipal utilities are establishing and whether or not the utilities have been on an earning basis. Many of the 100 plants included in this compilation are competing with private companies, some are tax free, and all are successfully operated. A table is also included showing charges for services in 20 representative Canadian municipalities. Copies of this booklet may be secured from Burns & McDonnell. Price: $1.00.

Neil N. Campbell, 273 E. Market Square, Lake Forest, Ill., is preparing plans for the White Pines Golf Course, Bensenville, Ill., and for a sanitary sewer in Lake Forest.

B. C. McCurdy, Belleville, Ill., is preparing a survey and plan for trunk sewers for the Village of Monsanta, as provided for in the general bond issue for $170,000 at the election in January, 1932.

W. N. Brown, President, W. N. Brown Inc., 969 National Press Bldg., Washington, D. C., is the author of an article in the January issue of *The Baltimore Engineer* entitled "The Topographic Survey of the Upper Mississippi River and the Application of Aerial Photography to Map Work." Mr. Brown will be glad to furnish reprints of this article to any one interested.

F. L. Knight & Sons, 8 Crawford Bldg., Crown Point, Ind., are preparing plans for a park layout, including a night athletic field, for the City of Crown Point and for an addition to the Merrillville cemetery, with possible service and rest room facilities. The construction of roadways, including drainage, tennis courts and a golf course, for the Wildwood Community summer resort on the Kankakee River near Schneider, Ind., is being supervised by this firm. Earle Jones has recently joined the staff.

Fred C. Carstarphen, 721 Marion St., Denver, Colo., was a member of the commission reviewing the gas and electric rates of the Public Service Co. of Colorado which recently completed its studies. Recently Mr. Carstarphen addressed the Colorado Chapter of Petroleum Geologists on the subject "Heat and Its Geological Aspect," a portion of which address appeared in the February, 1932, issue of *The Mines Magazine*.

Charles Foster, Consulting Engineer, 512 Sellwood Bldg., Duluth, Minn., is preparing plans for an addition to a school building for Ironwood Township, Mich., mechanical equipment for a school at Deer River, Minn, and the Aftenro Home Addition, Duluth, Minn., and for a sewage disposal plant for Nopeming Sanatorium, Nopeming, Minn.

Black & Veatch, Kansas City, Mo., have prepared a survey of the Ord, Nebr., electric and water plant with regard to the best possible improvements for enlarging the plant, when such enlargement is deemed necessary.

Murray & Flood, 369 Lexington Ave., New York City, have announced the appointment of Howard B. Hall as Director of the Industrial Division. This firm is planning increased activities in industrial management and reorganization work, particularly with reference to specializing in sales-increasing surveys, in which field Mr. Hall has had wide experience.

William H. Adams, Consulting Engineer, 2539 Woodward Ave., Detroit, Mich., reports that he recently prepared a series of six articles on the cost of government in Highland Park, Mich., which appeared in the *Detroit News*.

Henry J. Saunders, 643 Transportation Bldg., Washington, D. C., is an expert witness for the U. S. War Department in the Bonnet Carre Spillway, Louisiana, condemnation case and for the Ashley, Drew & Northern Railway, Mount Hood Railroad, and Minneapolis, Northfield & Southern Railway in cases for the recapture of excess income before the Interstate Commerce Commission.

McNamara & Nosky, North Platte, Nebr., are preparing plans for the formation of an irrigation district in Buffalo County, Nebr., to irrigate 4,000 acres of land. The construction of a sewage disposal plant and outlet sewer for Kimball, Nebr., is going on under this firm's supervision.

Russell & Axon, Consulting Engineers, 229 Roosevelt Bldg., St. Louis, Mo., are preparing preliminary reports for a water works and lighting plant for St. Charles, Mo. They are also supervising the construction of a water works and distribution system for Millstadt, Ill., an outfall sewer for Troy, Mo., and a water supply line for Columbia, Ill.

Standard Specifications for Highway Bridges

A 237-PAGE volume entitled "Standard Specifications for Highway Bridges and Incidental Structures" has recently been published by the American Association of State Highway Officials, National Press Bldg., Washington, D. C. These specifications have been prepared for the purpose of encouraging and promoting a more uniform practice in the design and construction of highway bridges. They have been written primarily to meet the need of state bridge engineers for a complete working specification, and are limited to the field of highway bridges, not providing for unusual span lengths and types of construction, for which provision must be made by special or supplementary specifications.

In addition to the essential requirements for the design and construction of satisfactory bridges, these specifications often contain brief reasons for the requirements and instructions which would ordinarily be contained in a manual of practice, indicating how the desired results may be achieved. The book is divided into five main sections: General Provisions; Materials; General Construction; Special Construction and Design. Original investigations have been made of experimental data on phases of the subject upon which there has been much divergence of opinion. Special study also has been devoted to those practices which, though widely followed, seem to have insufficient justification.

Determination of Insulation Properties Feature of Testing Laboratory Work

B. H. Witherspoon, President

ACCORDING to a report from the PITTSBURGH TESTING LABORATORY, 1330 Locust Street, Pittsburgh, Pa., this company has now in operation equipment for determining air leakage and heat and sound insulation properties of building materials and equipment used in connection with the much discussed manufactured weather for the present-day building construction. The equipment will reach a temperature of 50° F. below zero and will be capable of testing full sized wall, floor and roof panels, doors, windows, etc. It is the largest installation of its kind in industry. Under their supervision are being built the Boston Post Office, Boston, Mass.; the Bankers Trust Company Building, New York; the Mellon Institute of Industrial Research, Pittsburgh; Outer Drive Roadway and connecting structures, Chicago; Louisville & Nashville Railroad Crossing over the Ohio River at Hendersonville, Ky. They are supervising the street paving in Houston, Tex.; New Orleans, La.; and Mobile, Ala. Recently they were called as expert investigators for the Erie County, New York, road pavement case and for the street pavements in Melvindale, Michigan. They were also called as experts in the valuation of gas pipe lines in Ohio and West Virginia rate hearings as well as experts in damage suits involving explosions and atmospheric pollution. In the latter case an experimental farm was conducted to study the effect of polluted atmosphere on vegetation.

A. R. Ellis, Vice President

A College Sewage Disposal Plant

(*Continued from page 45*)

gravity onto drying beds covered by a standard greenhouse. The filter media of these beds are 32 inches deep of layers of sand, gravel and stone with terra cotta underdrains resting on a concrete floor. The effluent flows into the outfall line from the final tank to Carvins Creek. The raw sewage is treated with chlorine just ahead of the screens. Final chlorination is effected by introducing the chlorine to the trickling filter effluent just ahead of the final tank, for the purpose of bacteria and odor control. Chlorine is fed through a vacuum type solution feed chlorinator.

The grounds are graded around the plant and shrubbery and grass will be planted at the proper season. The plant is under the close personal supervision of the College Engineer.

The Design of Dams

THE increased development of water supplies for irrigation, generation of electric power, domestic consumption and industrial use during the past two decades has intensified the need for complete and scientific methods in the design of dams. The need led to the preparation of an up-to-date and comprehensive treatise on the theory and practice of the design of dams by Frank W. Hanna and Robert C. Kennedy, Chief Engineer and General Manager, and Chief Designing Engineer, respectively, of the East Bay Municipal Utility District, Oakland, Calif. Both of the authors are members of the American Society of Civil Engineers.

All types of modern dams have been given full treatment, including the various types of solid and deck gravity, single and multiple arch, earth and rock-fill dams and their accessories. While extraneous subjects have been omitted for the purpose of keeping the size of the volume at a minimum, subjects related to the design of dams have been included, covering accessories for dams, reservoir and dam site surveys, rainfall and runoff of streams, and hydraulics and measurement of stream flow. The book is concluded with a long list of failures of dams and their causes and natures.

"The Design of Dams" is published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. The price is $5.00.

Government Services Available to Civil Engineers

THE Manual of Engineering Practice No. 7, compiled under the direction of the Committee on Publications of the American Society of Civil Engineers, sets forth, by means of lists and organization diagrams, information about the various Government Departments whose functions the civil engineer can use in the practice of his profession. The various topics are arranged alphabetically. Copies of this Manual may be secured from the American Society of Civil Engineers, 33 West 39th St., New York City. The price to members is 25 cents and to non-members, 50 cents.

Utilization of Finer Sizes of Gravel in Concrete Highway Construction

CIRCULAR 9, one of a series issued by the National Sand & Gravel Association, Inc., Washington, D. C., was written by Bert Meyers, Engineer, Materials and Tests, Iowa State Highway Commission, who presented it at the fifteenth annual convention of the National Sand & Gravel Association in St. Louis, January, 1931. The article describes the experience of one state highway department in the utilization of greater quantities of the finer sizes of aggregate in concrete pavement construction than is the general practice. Mr. Meyers, in his circular, discusses the method of proportioning the materials for concrete when only the finer sizes of aggregate are used. Data is also given on the economy of the mixtures, strength of concrete and the service results obtained over a period of about four years. Copies of this circular may be secured from the National Sand & Gravel Association, Inc., Munsey Bldg., Washington, D. C.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Contractor Bore Loss Caused by Ravages of Uncontemplated Storm

A contractor's undertaking to do filling on a lake shore in connection with the construction of a filtration plant and clear water basin was an undertaking to deliver a completed construction, "in spite of Hades and high water," according to the opinion filed August 6, 1930, by the United States District Court for the Western District of New York in the case of Maryland Casualty Co. v. Board of Water Commissioners of City of Dunkirk, 43 Fed. 2d, 418. The whole story of this phase of the case is thus told in the language of the court:

"It appears that a certain amount of filling and grading was to be done under the contract at the outside of the structures and along the shore of Lake Erie. A considerable amount of this filling had been done, when it was practically all destroyed by a heavy storm on the lake the night of December 8, 1927. On that night the water of the lake reached its highest point in sixty years. After the storm, the contractor replaced this filling and was obliged to obtain the dirt for that purpose from a considerable distance. This greatly increased the cost of the work. It is the contention of the complaintant that, as the contractor had disposed of the earth and made the grading according to the plans, he is entitled to be compensated for the expense of replacing the work. I find that as the contract called for the delivery of a completed structure, the Board of Water Commissioners is not responsible for the expense of replacing the grading and embankment washed away by the waters of Lake Erie."

When Letter Libels Addressee

Since there is no such thing as actionable libel unless the defamatory statement is published to one or more third persons, the mere sending of a letter in which the writer speaks derogatorily of the addressee does not give the latter a cause for suing the writer. As once said by the Massachusetts Supreme Judicial Court, "Sending a libelous letter through the mail to the person libeled, with no reason to suppose that it will be opened and read by any one else before he has received and read it, is not a publication which will support a civil action for libel."

The rule stated by the Massachusetts court applies mainly to letters written to individuals not known by the writer to have a clerk or assistant to receive and read personal correspondence. The rule does not apply to ordinary business correspondence. For example, one addressing a letter to a contractor doing a substantial volume of business must contemplate opening and reading of the letter by a clerk or secretary before the contractor will read it. If it is so opened and read, there is sufficient publication of the libel to create a basis for a damage suit.

In the recent case of Olson v. Molland, 232 N. W. 625, the Minnesota Supreme Court decided that where a personal letter was received, opened and read by the addressee, she could not maintain an action for damages based upon the fact that her mother snooped into a dresser drawer, found the letter and read it. The publication of the libel in that case was the fault of the addressee, not that of the writer.

How Much Variation in Thickness of Concrete Pavement Is Permissible?

The law is not so unreasonable as to exact that concrete paving slabs be precisely of specified dimensions. Yet, the decision handed down by the New York Court of Claims in the case of Foote v. State, 245 N. Y. Supp. 565, shows that somewhere around 26/32 of an inch is the deadline shortage that is permissible on slabs supposed to be 6 or 7 inches thick.

A highway paving contract called for 1,288 slabs 9 x 40 feet, tapering laterally in thickness from 6 to 7 inches. Inspection after laying of the pavement showed a shortage in the thickness of 102 slabs, and the State required replacement of those slabs. The cost was about $12,000, which the contractors sought to recover, having made the replacement under protest.

It appeared that 44 of the slabs were short from 26/32 to 1 22/32 inches in thickness, at the points where the measurements were taken. The remaining slabs showed less shortage. Under these circumstances, the Court of Claims said:

"The departures from the required thicknesses under the contract involved, so far as said 44 slabs are concerned, were substantial. The measurements of these removed slabs indicated 1,760 feet of defective pavement. This was, in my judgment, not such a performance of the contract as to justify full recovery. It may be claimed that to hold that a deficiency of 26/32 of an inch is not substantial performance is a purely arbitrary action, but the line must be drawn somewhere, and, to repeat, each case of this nature must be determined according to the facts disclosed. I think that the state had the right, under this contract, to order the removal of portions of the pavement which were substantially defective, and that right is not affected by the facts that more material than necessary was placed in the entire pavement or that the average deficiency of the whole pavement from the contract requirements was, as claimed, less than 1/3 of an inch.

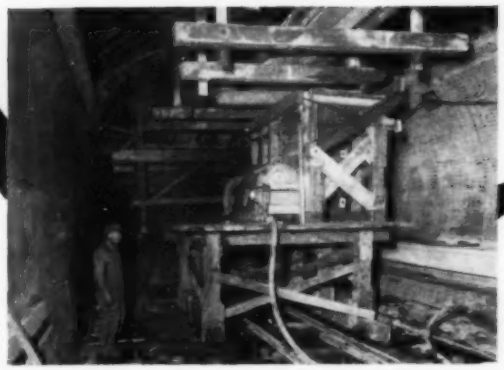
"I am satisfied, after a careful consideration of the evidence in this claim and having in mind the decision in the Chambers Case, that claimants are not entitled to an award for removing or re-laying the 44 slabs mentioned. So far as the remaining slabs or pavements are concerned, the variations were slighter, . . . claimants in laying those slabs conformed substantially to the requirements of the contract, and are, therefore, entitled to an award for the value of the material and labor required in their removal and replacement as computed in accordance with the item prices in the contract less the value of the shortage."

Assignment of Money Due Subcontractor Put It Beyond Reach of His Creditors

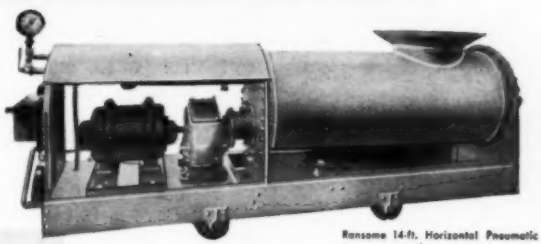
"Please pay Williamson & Sons $500 out of the first money due me from you," in effect wrote a highway subcontractor to the general contractor. "We'll do it," in effect wrote back the contractor.

That sewed the $500 up—put it beyond the reach of creditors of the sub other than Williamson & Sons, the assignee, ruled the Arkansas Supreme Court in the case of Bingham v. Williamson & Sons, 40 S. W. 2d, 995.

the STORY of Ransome PNEUMATIC PLACERS



Placing roof of Vehicular Tunnel—New York City to Jersey City.



Ransome 14-ft. Horizontal Pneumatic Placer. Capacity 14 cubic feet per shot.

Ransome Pneumatic Grout Mixer and Placer.

Every contractor and every engineer who has a problem of placing concrete in subways, railroad tunnels, water tunnels, sewers or mines should have a copy of our new illustrated 24-page Bulletin No. 105 B.

It tells the advantages of using the Ransome Pneumatic Concrete Placer and the Ransome Pneumatic Grout Mixer and Placer—lists important jobs—contains air requirements, outputs and other operating data. It is a hand book on placing concrete and grout by compressed air.

Send for a free copy—and mail the coupon.

FILL OUT AND MAIL THIS COUPON FOR DETAILED INFORMATION ON SPECIFIC JOBS

1. Length of tunnel, end to end.....
2. Length between shafts.....
3. Height and width in rough.....
4. Height and width, finished section.....
5. Minimum thickness of concrete and point at which it is found.....
6. Amount and location of reinforcing.....
7. Is tunnel in rock or earth?.....
8. Will tunnel excavation be completed before lining?.....
9. If mucking, while lining, must muck cars pass through forms?.....
10. If in soft ground, will concreting follow up behind heading?.....

Estimated distances.....

11. Length of form used, steel or wood, and print of same.....
12. Type of concrete cars. Height and width.....
13. Locomotive (if used). Height and width.....
14. Size and kind of gravel or stone used.....
15. Compressed air available in cubic feet per minute.....
16. Will drills, air hammers, etc., operate from this supply when blowing concrete?.....
17. Gauge and size of track used.....
18. Electric current available for operating motor on placer.....
19. How much yardage to be placed by air is involved?.....
20. What length of time allowed for placing this yardage?.....
21. Make sketch showing measurements mentioned in 3, 4, 5 and 6.....
22. For whom is job being done?.....

Location of job.....

Name.....
Company.....
Position.....
Address.....
City.....State.....

Ransome Concrete Machinery Company

DUNELLEN **1850—Service for 82 Years—1932** **NEW JERSEY**

Construction Industry News

The Hanson Clutch & Machinery Co., Tiffin, Ohio, has announced that since February 15, it has added the following firms to its distributor organization: The Raleigh Tractor & Equipment Co., Raleigh, N. C.; Nixon-Hasselle Co., Chattanooga, Tenn.; Western Material Co., Sioux Falls, S. D.; Dow-Potter Co., Buffalo, N. Y.; Earnest Bros., Richmond, Va.; General Equipment Co., Clarksburg, West Va.; Henry A. Petter Supply Co., Paducah, Ky.; John D. Turner Co., Birmingham, Ala.; Joe Lyons Machinery Co., Little Rock, Ark.; and C. A. Lippincott & Co., Moorestown, N. J.

Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill., has announced the appointment of R. W. Cornelisen as field sales manager. Mr. Cornelisen has been associated with the Lakewood Engineering Co. and the Jaeger Co., and has a wide acquaintance among dealers and contractors throughout the country.

Farm Tools, Inc., Mansfield, Ohio, has announced the appointment of E. E. Quick as General Sales Manager to succeed Frank H. Smith. Mr. Quick will direct the sales of all four divisions including Vulcan Plow, Roderick Lean, Hayes Pump & Planter and Peoria Drill & Seeder.

Chain Belt Co., Milwaukee, Wis., has announced the appointment of the Holmes-Talcott Co., 103 Sterling Road, East Hartford, Conn., as its distributor in Connecticut and for a few counties in Massachusetts and of the T. D. Harter Co., 205 N. Townsend St., Syracuse, N. Y. These two companies will handle the complete line of Rex mixers, pavers, pumps, saw rigs, plaster and mortar mixers and other construction equipment. The Colon-Jopson Co., 750 Main St., Hartford, Conn., will be the exclusive distributor of Rex Moto-Mixers in the Hartford territory.

Medusa Products Co., 1002 Engineers Bldg., Cleveland, Ohio, has been organized as a subsidiary of the Medusa Portland Cement Co., and will function as the selling company for Medusa portland cement paint, Medusa floor coating and primer as well as the entire line of rust-proof coatings and technical paints manufactured by the Studebaker Chemical Co., Elyria, Ohio, for which they will be exclusive distributors.

The Four Wheel Drive Auto Co., Clintonville, Wis., has announced the appointment of Guy H. Billings as Assistant General Manager. Mr. Billings, who has been with the company for 19 years, has served the past 17 years as Purchasing Agent, a title which he will retain in his new position.

American Road Machinery Co. and **The Good Roads Machinery Co.**, Kennett Square, Pa., report that the reorganization plan of these two companies contemplating their consolidation into one company known as the Good Roads Machinery Corp. will soon be completely effected. The new corporation has been chartered and has taken over the sale of all of the products of the former companies. A number of improvements in the products are reported, details of which will be announced soon.

Link-Belt Co., Chicago, Ill., has announced the election of George Paull Torrence, Vice-President in charge of the company's Indianapolis operations, as President of the company. Mr. Torrence has been associated with the Link-Belt Co. for 21 years.

Gravel Packing for Subaqueous Tunnels

To the Editor.

DEAR SIR:—The article in the March number of CONTRACTORS AND ENGINEERS MONTHLY entitled, "Belt Conveyors Handle Muck of Subaqueous Tunnel," describing the novel and efficient use of belt conveyors at the East Boston Traffic Tunnel is a clear and timely presentation of this unique improvement. The article is also replete with information on the general subject of shield tunneling which, while subordinate to the main idea of describing and illustrating the belt conveyor as a substitute for muck cars, makes it a valuable contribution to shield tunnel construction literature.

Having in mind all this excellence and my unstinted approval of the article as a whole, may I be permitted to call attention to something apart from the main subject, though itself of great importance, which gives an idea different from what is being done, and which, moreover, has been proved impracticable by actual trial. On page 23 is a paragraph headed, "Grouting the Tunnel," which speaks of placing an annular ring 3 inches in thickness of grouting around the tunnel, which is described as a mixture of one bag of sand to six bags of pea gravel, forced through the grout holes by the O'Rourke method. This annular ring of sand and pea gravel around the tunnel was ejected through the grout holes in an air blast, the apparatus for which is like that used to sand blast fronts of buildings, a common sight on the streets.

At the time this gravel packing idea was being developed by experiment I tried to force pea gravel through grout holes from a grout mixer, the gravel replacing the sand and cement of the grout in the same proportion of water. Although the rapidly revolving worm in the mixer for keeping the sand and cement stirred up was used with the gravel, all the water in the mixer passed out but none of the gravel flowed with it, as the sand and cement of grout always does, showing conclusively that pea gravel with water in a grout mixer cannot be forced through a grout hole into a space surrounding a tunnel.

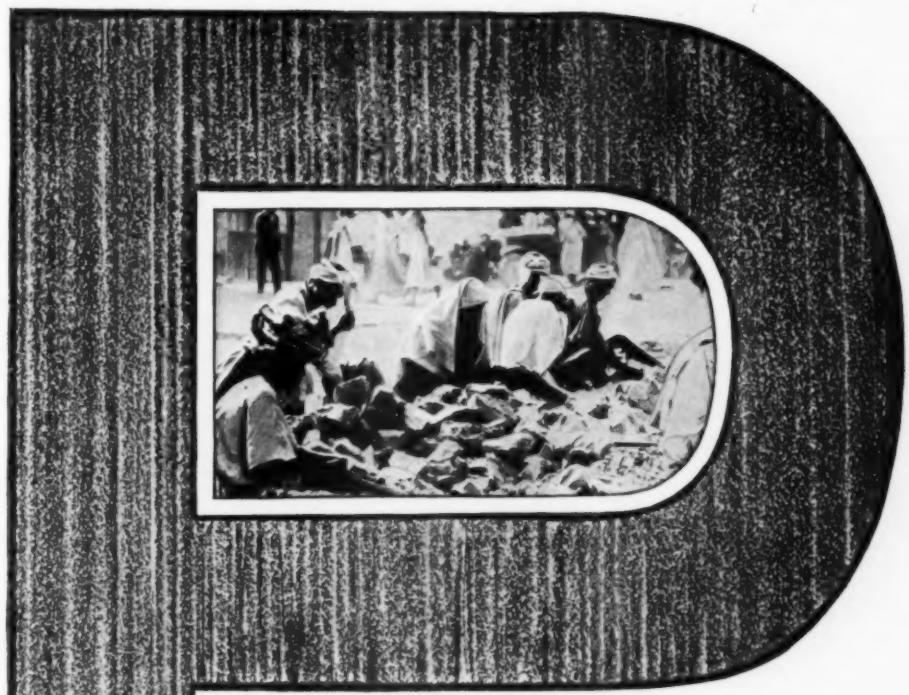
It is in saying that the sand and gravel is grouting and is forced through the grout holes that the article is misleading. The present very satisfactory situation at the Boston Tunnel in which there are no settlements of overlying ground or distortion of the structural steel rings, is due entirely to the air blast method originated by me, which tightly packs the empty space with a loose, solid material which gives immediate support to both ground and tunnel lining.—Very truly yours, John F. O'Rourke.

Standards for Steel Reinforcing Bars

AN American Standard for steel reinforcing bars has just been approved by the American Standards Association. The new American Standard gives eleven standard cross-sectional areas for steel reinforcing bars, varying from 0.05 to 1.56 square inches. Such designation is commonly used for this product, rather than designating a round bar by its diameter or a square bar by its side.

The Standard was submitted to the American Standards Association jointly by the Concrete Reinforcing Steel Institute and the National Bureau of Standards, as endorsing sponsors. The Institute, which represents a large percentage of fabricators of steel reinforcing bars, has strongly promoted the establishment of the standard in question, while the U. S. Bureau of Standards has published the standard as Simplified Practice Recommendation R26-30.

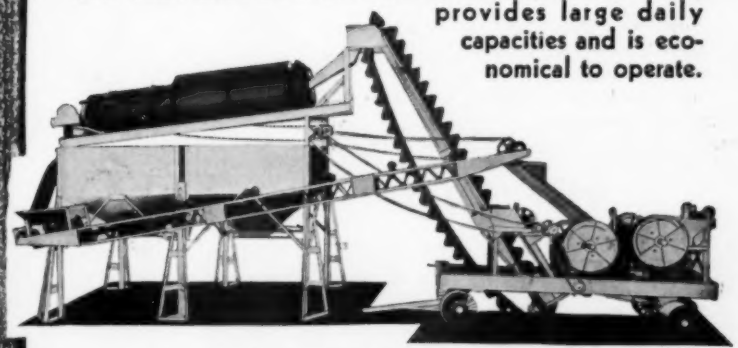
Copies of the standard are available from the American Standards Association, 29 West 39th St., New York City, at five cents each.



This is the way they crush gravel in Morocco, where labor is cheap.

IONEER

portable gravel equipment provides low-cost gravel from roadside pits. From the large 300W Pioneer Washing, Screening, Crushing and Loading Plant to the simplest screening plant, there is a "setup" to fit your needs. The new 45B Portable Pioneer Quarry Plant, pictured below, provides large daily capacities and is economical to operate.



Nowadays low-cost gravel is obtained the "Pioneer" way.

No. 45B PIONEER DUPLEX QUARRY PLANT

consists of heavy-duty truck, Timken bearing-equipped, on which is mounted two jaw crushers, or one jaw and one roll reduction crusher (45BR Duplex); also bucket line with extra large buckets (16" x 12"); two 21-yd. Pioneer steel storage bins, over which is mounted a 42" diameter revolving screen. Four sizes of material may be produced, as bins have partitions. A scrubber section may be installed in revolving screen to permit washing finished material.

Pioneer Gravel Equipment Manufacturing Co.

Minneapolis 1515 Central Avenue Minnesota

Write for name of nearest Pioneer Distributor

The Equipment Distributor

Death of Geo. F. Smith

GEORGE F. SMITH, who headed the firm of The Geo. F. Smith Co., equipment dealers in St. Louis, Mo., died suddenly on the morning of March 21. He had been in poor health for over a year, having failed to recover from a major operation, and was able to attend to his business only occasionally. He was well known among the contractors and was held in great respect by all of them. He was interested in the general welfare of the construction industry and devoted much time to his branch of the industry, having served as President of the Associated Equipment Distributors. Mr. Smith had been in the equipment business for twenty-five years and was a member of the Associated Equipment Distributors, as well as one of their organizers, and served on numerous committees connected with the construction industry. The Geo. F. Smith Co., being a corporation, will continue to carry on in the equipment business at the same location.

Geo. F. Smith

The many devoted friends of George Smith among manufacturers and distributors of contractors' equipment may be interested to read the three following letters about him, which were received by CONTRACTORS AND ENGINEERS MONTHLY:

"When I heard the news about George Smith's death, I don't believe I could have felt any worse had it been my own brother. I have seen George in so many ways and so many positions—fishing, hunting, working, playing—that I came to know him very well, and the longer I knew him the better I appreciated the qualities that often I wished I possessed myself.

"George was always an inspiration to me, and I think to everyone who knew him. No matter what George's contact was, he always kept his individuality and personality, he never bragged and seemed to me always the same likeable person. George belonged in New England, but most St. Louis people were Yankees anyway. My only regret in my contact with George Smith was that he lived so far away from me, that I could not see him often enough to satisfy my desire for his companionship and there is no one whom I know of who will exactly fill his place."

K. B. Noble, President
The K. B. Noble Co., Hartford.

"I was very much saddened to hear of George Smith's death. The A.E.D. lost one of its most conscientious workers and a member who from its very founding has given unstintingly of his time and services.

"George was loved, I am sure, by everybody who knew him. He was a kindly, honest, Christian man. I can well remember in December, 1919, when standing at the depot in Pittsburgh, I suggested to George that we ought to organize a distributors' association in our field and the enthusiasm and encouragement that he gave to the movement.

"He may be gone, but his memory will always remain with those who knew him, I am sure."

Morton R. Hunter, President.
Hunter Machinery Co., Milwaukee.

E. K. Hurst, Pres., A. E. D.

"I feel keenly the death of George Smith. He was a delightful character and a real friend to have on one's list. The Associated Equipment Distributors will certainly miss his untiring efforts to further the interests of the Association, and with George gone, the industry loses one of its most esteemed and interesting figures. No one who knew George intimately could fail to appreciate and admire him."

J. A. McDivit, President,
The Henry H. Meyer Co., Baltimore.

A. E. D. Annual Meeting

THE thirteenth annual meeting of the Associated Equipment Distributors was held at the Book Cadillac Hotel, Detroit, on January 9 and 10, 1932. A good attendance was recorded with practically every state being represented. The meeting was presided over by Oscar Bjorge, Clyde Equipment Co., Portland, Oregon. After the regular business and reports had been disposed of an interesting program was presented including: a discussion of the Flat Rate system for service shop operation by George R. Lindblom, Vice-President and General Manager, Edwards Motor Car Co., Milwaukee, Wis.; a discussion of the question, "Shall the Associated Equipment Distributors adopt standard quality condition

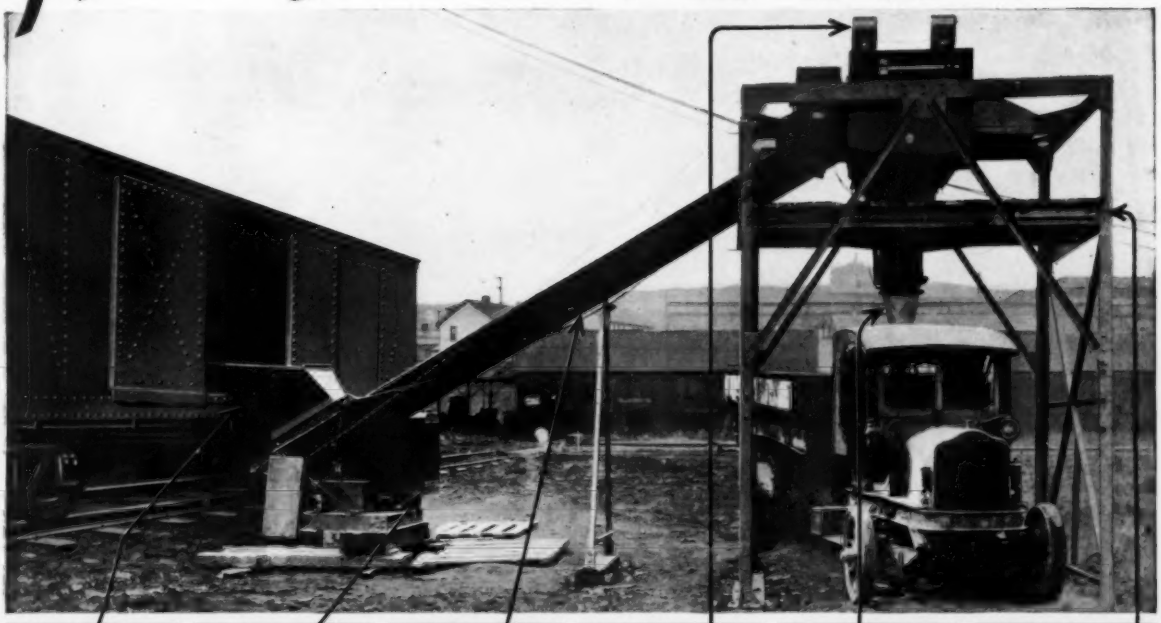
C. E. Baker, 1st Vice-Pres., A. E. D.

Robert R. Nixon, 2nd Vice-Pres., A. E. D.

A. C. Blaisdell, Secy., A. E. D.

H. W. Fletcher, Treas., A E. D.

The BLAW-KNOX . . . *Low Cost* *Handy* BULK CEMENT PLANT



ADJUSTABLE TO CAR HEIGHT
Hinged car hopper for loading cement into screw conveyor.

AMPLE POWER
26 H. P. 4 cylinder gasoline engine with reduction gear and drive. Mounted on steel base.

NO DUSTING
12 inch inclined screw conveyor, completely enclosed.

SHIPPED ASSEMBLED
1000 pound Double Beam Cement Weighing Batcher with two springless dial indicators which show when batcher is full or empty.

CONTROLLED DISCHARGE
Canvas discharge chute from batcher to truck.

PORTABLE
Portable steel frame for support of Cement Weighing Batcher and screw. Includes operators platform with wood decking.

A new development—A Blaw-Knox BULK CEMENT PLANT equipped with vertical screw elevator for the cement—compact and portable.

A real inexpensive plant. It's portable—can be quickly set up and moved from job to job. There is plenty of clearance for trucks; no need to dig out for the driveway. Can be furnished with automatic control batcher if desired.

No bin required. The Blaw-Knox HANDY Bulk Cement Plant will operate fast enough to keep your job moving.

Blaw-Knox is thorough . . . painstakingly thorough, in designing its complete line of equipment for the storage, handling and batching of bulk cement. Plants of various types and sizes are available.

Complete detailed information and prices will be sent to you.

BLAW-KNOX COMPANY, 2067 Farmers Bank Bldg., Pittsburgh

New York—Chicago—Cleveland—Buffalo—Birmingham—Philadelphia—Baltimore—Detroit

EXPORT DIVISION:—Blaw-Knox International Corporation, Canadian Pacific Building, New York
Pacific Coast Division:—Blaw-Knox & Western Pipe Corp., San Francisco
London, England, New Oxford House, Hart St., Holborn, W.C.I.—Milan, Italy, 6, via S Agnese, 6
Paris, 8, France, 4 Place des Saussais Dusseldorf, Germany, 17 Bismarckstrasse

BLAW-KNOX

Road Forms—Ord Road Finishers—Batcherplants—Weighing Batchers—Concrete Buckets—Bulk Cement Plants—Wagon Graders—Steel Forms for Streets and Sidewalks
Truck Turntables—Clamshell and Dragline Buckets—Ready Mixed Concrete Plants—Truck Mixers—ATECO Hydraulic Scrapers, Bulldozers, Scarifiers, Tamping Rollers

specifications for used equipment to aid the sale of equipment between members?" by Mort R. Hunter, Hunter Machinery Co., Milwaukee, Wis.; "What A. E. D. Members have done to cut costs with business at depression levels" by H. O. Penn, H. O. Penn Machinery Co., New York City; "Construction Outlook for 1932" by Carl E. Baker, Smith Booth Usher Co., Los Angeles, Calif.; and "What has the depression taught the members about inventory?" by George E. Hillsman, Geo. E. Hillsman Co., Chicago, Ill. Another speaker was Colonel Willard T. Chevalier, Publishing Director, *Engineering News-Record*, whose address covered a wide range of thought.

The list of new officers of the Associated Equipment Distributors who were elected at the annual meeting in January is as follows: President, E. K. Hurst, Western Material Co., Sioux Falls, S. D.; 1st Vice President, Carl E. Baker, Smith Booth Usher Co., Los Angeles, Calif.; 2nd Vice President, R. R. Nixon, Nixon-Hasselle Co., Chattanooga, Tenn.; Secretary, A. C. Blaisdell, Queen City Supply Co., Cincinnati, Ohio; Treasurer, H. W. Fletcher, Fletcher Equipment Co., Inc., New Orleans, La.; Directors, G. E. Hillsman, The G. E. Hillsman Co., Chicago, Ill.; Victor L. Phillips, the Victor L. Phillips Co., Kansas City, Mo.; Thorman W. Rosholt, Thorman W. Rosholt Co., Minneapolis, Minn.; E. W. Gierke, Gierke-Robinson Co., Davenport, Iowa and John C. Louis, John C. Louis Co., Baltimore, Md.

C. H. Arnold Co., Inc., Park Bldg., Pittsburgh, Pa., has been appointed distributor for the Sullivan Machinery Co., Chicago, Ill., in Pittsburgh and adjacent territory. A complete stock of Sullivan air compressors, rock drills, concrete breakers, clay spaders, portable hoists, drill sharpeners and their parts will be carried at the C. H. Arnold Co.'s warehouse in Sharpsburg, Pa.

H. O. Penn Machinery Co., 140th St. & East River, New York City, has announced that D. D. Barnes, formerly Sales Manager for the Smith Engineering Works, has joined its sales staff. This company has recently been appointed distributor for the Chicago Pneumatic Tool Co., New York.

Harry C. Collins Machinery Co., 2013 Santa Fe Ave., Los Angeles, Calif., has opened new office and show rooms at this address. Harry Collins has had 25 years experience in handling all classes of mining equipment, crushing, contracting and industrial plants. He will also rent and sell used machinery.

DeHuff & Hopkins, Philadelphia, Penna., has been appointed distributor for the O. K. Clutch & Machinery Co., Columbia, Penna.

W. A. Gordon, 13415 S. Woodland Ave., Cleveland, Ohio, who resigned as Sales Manager of the Empire Plow Co. and General Wheelbarrow Co., Cleveland, Ohio, on April 1 is planning to start a distributing agency in the Chicago, Detroit, Cleveland and Pittsburgh territory for hardware and contractors' lines.

George Malvese & Co., New Hyde Park, N. Y., gave its annual dinner party to Long Island highway officials and other friends at the Elks' Club, Hempstead, Long Island, on March 31, 1932. The invitation was a real "hard-times" affair but the banquet and entertainment were replete with things to please the palate, eye and ear.

Superior Construction Equipment Co., Chicago, Ill., has recently announced its appointment as distributor in the states of Illinois and Indiana for the O. K. Clutch & Machinery Co., Columbia, Penna.

Distributors' Bulletin Board

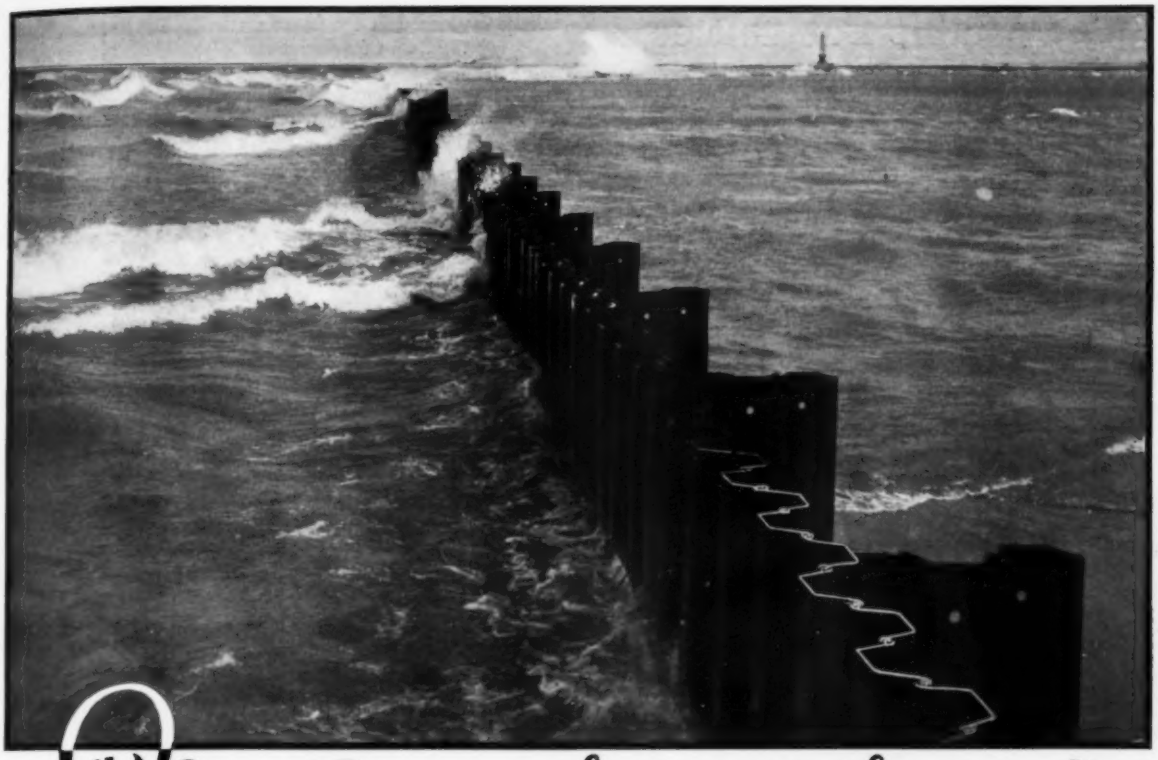
The distributors of construction equipment listed below have made changes this month in their cards appearing in the Distributors' Directory on pages 79 to 102 of this issue of CONTRACTORS AND ENGINEERS MONTHLY:

C. H. Arnold Co., Pittsburgh, Pa.
O. B. Avery Co., Saint Louis, Mo.
Beckwith Machinery Co., Pittsburgh, Pa.
Boehck Equipment Co., Milwaukee, Wis.
Brandeis Machinery & Supply Co., Inc., Louisville, Ky.
Brewster & Williams, Inc., Syracuse, N. Y.
Cyril J. Burke, Detroit, Mich.
The Cletrac Ohio Sales Co., Cleveland, Ohio
Paul Cochran Equipt. Co., Chicago, Ill.
Construction Equipt. Co., Spokane, Wash.
A. P. Dienst, New York City
Dukehart Machinery Co., Des Moines, Iowa
D. C. Elphinstone, Inc., Baltimore, Md.
Evans Tractor & Equipment Co., Rapid City, S. D.
General Tractor & Equipment Co., Minneapolis, Minn.
Gibbes Machinery Co., Columbia, S. C.
Giles & Ransome, Philadelphia, Pa.
Hall-Perry Machinery Co., Butte, Mont.
Interstate Machinery & Supply Co., Omaha, Neb.
Kratz & McClelland, Inc., San Francisco, Calif.
The Henry H. Meyer Co., Baltimore, Md.
Minneapolis Equipment Co., Minneapolis, Minn.
H. W. Moore Equipment Co., Denver, Colo.
The K. B. Noble Co., Hartford, Conn.
Northwest Equipt. Co., Inc., Great Falls, Mont.
T. L. Pitts & Son, Charlotte, N. C.
The Queen City Supply Co., Cincinnati, Ohio
Shearer & Mayer, Indianapolis, Ind.
Superior Construction Equipment Co., Chicago, Ill.
Western Material Co., Sioux Falls, S. D.
Wm. H. Ziegler Co., Inc., Minneapolis, Minn.

An Air-Controlled Road Planer

THE Pneu-Hydro road planer or conditioner, which is designed for high speed maintenance work and which is controlled entirely by a low pressure air system, is manufactured by the Pneu-Hydro Road Machinery Co., Cadillac, Mich. This planer, which is made in an 8-foot size for mounting on 1 to 2-ton trucks, a 10-foot size for 2 to 3-ton trucks and a 12-foot size for trucks of 3 tons or heavier, will operate at any desired speed as high as 20 miles an hour, although according to the manufacturer, the best results are secured at speeds of 10 to 12 miles per hour.

All vibration and road shock are absorbed by two sturdy air cylinders. Pressure can be applied to either end of the machine independently of the other end, so that one end of the blade can be used for cutting and the other for spreading. The loose material is spread out before reaching the end of the blade, thus leaving no windrow or ridge along the shoulder or center of the road. The adjustment can be made in 15 seconds from the driver's seat without stopping the truck. For ordinary purposes the maintainer works on 20 to 30 pounds of pressure although the average pressure carried in the supply tank is 75 to 80 pounds. This is easily maintained by the accumulators which are of the water-cooled type and very simple in construction, or by a suitable compressor. The blade is equipped with a pneumatic lift, making it possible to raise or lower the blade quickly and easily. By using quick release clamps, the machine can be reversed to any desired position in about a minute's time, making it possible for the truck to operate with traffic on the road.



"... Nor fear to breast the sea"..

This breakwater at Waukegan, Illinois, designed by U. S. Engineers, Second Chicago District, and constructed by the Luedtke Engineering Company, demonstrates the perfect adaptation of Carnegie Steel Sheet Piling to modern and efficient construction of sea-walls, breakwaters, jetties and piers. A group of practical, well-designed sections, both straight and arch web, cover every possible condition requiring the use of piling. An interlock of especially rugged construction, easy driving and exceptional watertightness characterize all Carnegie Piling sections. CARNEGIE STEEL COMPANY, PITTSBURGH, PA., Subsidiary of United States Steel Corporation.

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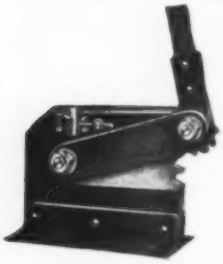
CARNEGIE STEEL SHEET PILING

A Portable Bar Cutter



The Portable Bar Cutter

HANDLING and rehandling a carload of reinforcing bars for concrete jobs is an expensive proposition. The rehandling can practically be done away with by the use of a Model-50 lever rod-cutting machine of the type made by the G.D.S. Shearing & Punching Machine Co., 109 Lafayette St., New York City. These machines are manufactured entirely from high grade steel plates and drop forgings guaranteed to be unbreakable. The machines do the work right on the job so that the contractor does not have to carry the bars to the machine but can take the machine to the materials and cut them there.

The Model-50 machine which is made in four sizes cuts bars from ⅝-inch to 1 inch in diameter or square rods from 9/16 to 15/16 inches. The net weight of the machine varies from 37 pounds for the smallest unit to 164 pounds for the largest. For best and easiest work, the machine is mounted 20 inches from the floor.

A New Bituminous Sewer Joint Compound

THE manufacturer of Hydro-Tite, a self-caulking joint compound for cast iron pipe, has announced a new bituminous joint compound for tile or concrete sewer pipe, under the name of Sani-Tite. The Hydraulic Development Corp., 50 Church St., New York City, manufacturer of both Hydro-Tite and Sani-Tite, announces that this new sewer joint compound meets all standard specifications, makes strong water-tight joints, adheres tenaciously to both tile or concrete and has high hydrostatic and tensile strength. It resists the alkalinity or acidity of sewage or the adjacent ground and its character makes it impossible for tree roots to enter the sewer lines. It permits a reasonable amount of flexibility without sacrificing the strength of the line and at the same time prevents infiltration even after considerable settlement in the pipe line. Sani-Tite sets quickly after the joint is made and does not become brittle or deteriorate with age.

Sectional Belt Conveyors

SECTIONAL belt conveyors, which are used to a considerable extent in the construction field and among pit and quarry operators because they are more practical than portable equipment where the work to be done is semi-permanent or permanent in nature, have recently been added to the line of Fairfield Engineering Co., Marion, Ohio. These Fairfield sectional conveyors are built of standardized units, making it possible to readily extend any conveyor to suit the requirements of plant expansion. Standard head and foot end sections of the proper size to provide for ultimate conveyor length, together with the required intermediate sections for initial use are originally provided. Additional intermediate sections can be added as desired. The use of easily assembled standardized units permits minimum installation costs both originally and as the conveyors are extended.

The steel frame sections are of the Warren truss type securely welded throughout. The various units are joined together by means of heavy sleeve bolts. The returning belt is protected by a sloping steel cover. The conveyor frames are designed for unusually long spans, thus avoiding the need of frequent supporting structures. They can be furnished with or without walkways, as desired.

These sectional belt conveyors are built with belts 18 or 24 inches in width, with maximum capacities for material weighing 100 pounds per cubic foot, of 160 tons per hour for the 18-inch belts, and 290 tons per hour for the 24-inch belts. Fairfield ball-bearing idlers are used throughout in these conveyor sections. The conveyors are driven by either electric motor or gasoline engine.

An Improved Type of Jaw Crusher

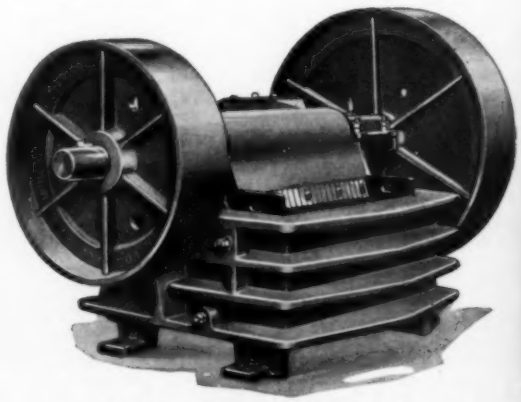
AN improved type of jaw crusher combining mechanical simplicity with great strength has been announced by the Pioneer Gravel Equipment Mfg. Co., 1515 Central Ave., Minneapolis, Minn. Pioneer crushers are made with jaw openings from 8 x 24 inches to 15 x 36 inches. Every effort has been made to reduce the number of mechanical parts to the minimum necessary to crush down the largest rocks which this unit receives to the required size in one operation. A heavy carbon electric steel crusher base holds the manganese steel stationary jaw in a vice-like grip. Opposite is the movable jaw strongly anchored to the pitman.

The heavy-duty pitman operates on well lubricated bronze bearings and is given an eccentric motion at the upper end by means of a heat treated chromium nickel steel eccentric shaft to which the power is applied from the driving motor by means of heavy flywheels. The lower end of the pitman swings in a modified circular path through the combined action of the toggle plate and the eccentric shaft.

The direction of rotation of the flywheel is over and towards the stationary jaw. Thus the movable jaw through its whole depth applies to the rock combined crushing and downward crowding action. This gives this style of crusher an increased crushing capacity.

The adjusting mechanism of the Pioneer crusher is entirely enclosed. This new feature consists of a steel cover plate over the push and pull wedges. A completely enclosed gear box is provided for the worm gear shaft and the two vertical adjusting screws. These improvements make it possible at all times to adjust the jaws regardless of whether or not the crusher is in operation.

Adequate lubrication is accomplished in a very simple manner. The side bearings are supplied with a constant flow of oil by means of oil rings traveling with the shaft. The proper oil level in these bearings is obtained by means of the oil filler plug located for easy access at the side. To eliminate possible dirt and foreign matter from the oil, a large settling chamber is provided. Only oil from the top of the oil chamber is carried to the shaft. The pitman bearing is supplied with oil by a drip system supplied by an oil chamber located in the center of the pitman head.



The New Pioneer 836 Jaw Crusher

Convertibility

ANYTHING IN YOUR WAY? MOVE IT WITH A General

Without changing any of the operating machinery THE GENERAL EXCAVATOR can be fitted, in the field, with the boom assembly best suited for any particular job.

The GENERAL EXCAVATOR is as nearly perfect as broad experience, advanced but proven design, modern manufacturing methods, good materials, and skilled workmen can make it. Approximately 90 per cent of the machine's weight is of steel, generously ribbed and braced.

The GENERAL is noted for its great STRENGTH, SPEED, POWER and CAPACITY. Powered with a 62-Horsepower, six-cylinder gasoline engine. It has a single line pull of 12,000 pounds. Compare THE GENERAL point by point with others and you will be surprised at the number of exclusive features offered.

THE GENERAL EXCAVATOR CO.
220 Rose Street, Marion, Ohio, U. S. A.

General EXCAVATORS
SHOVEL - DRAGLINE - BACKHOE - SKIMMER - CLAMSHELL - CRANE - MAGNET

A Universal Crushing and Screening Plant

Complete Portable Unit and Dual Crushing and Screening Plants

A COMPLETE line of portable crushing, loading and screening plants of various sizes have been announced by the Universal Crusher Co., 625 C Ave., N.W., Cedar Rapids, Iowa. These plants weigh complete from 31,000 to 40,000 pounds. An 18 or 24-inch heavy-duty rubber belt conveyor with stiff steel frame-work construction to keep it free from vertical or horizontal distortion, supplies the material from whatever source. The conveyors have triple troughing rolls equipped with Hyatt roller bearings on case-hardened shafts and with dust seals. A substantial screw take-up keeps the belt at proper tension. A sturdy roller bearing 2-wheeled trailer truck is supplied with the plant for easy and quick transportation of the conveyor between jobs.

The Universal steel crusher which is 8 x 24 or 8 x 36 is manganese steel equipped and quickly adjustable for fine or coarse crushing. The plant is equipped with a Simplicity gyrating screen either single or double deck as needed. The screen has low power consumption with large capacity and gives close grading. A 14-inch cross belt conveyor delivers the output of the crusher to the bucket elevator which carries the crushed material to the screen, thus closing the circuit. The steel frame folding elevator has a telescope bottom and a winding device for lifting it from the ground for clearance during transportation. The unit has an 18 or 24-inch delivery conveyor, 52 feet long and a 21-yard jack leg heavy-gage steel bin.

The dual plants are very similar in design to the unit plants. The truck is built longer to accommodate a second crusher which may be used as a primary crusher or as a second crusher to increase capacity.

Truck-Mounted Unit Breaks Concrete and Tamps Trench

A MACHINE for breaking concrete and for tamping trenches which has been in successful operation in Los Angeles, Calif., on Long Island, New York and in northern New Jersey, for from 4 to 6 years has been patented recently. This rapid pavement breaker is mounted on a 5-ton truck and is operated by an air compressor on a turntable so that it can swing from side to side and thus break a strip of concrete or tamp a trench from 1 foot to 11 feet long.

The machine strikes a controlled blow varying from a gentle tap to one of 18,000 pounds, 60 times a minute. On a roadway it is possible with this machine to break 2,000 square yards of 6-inch concrete in 8 hours or 1,000 square yards of hard, heavily reinforced 10-inch concrete. It can break from 500 to 1,500 lineal feet of trench in one day depending on the width, thickness and hardness of the concrete. In trench work a shearing tool cuts the concrete to a line. The machine strikes a repercussion blow and while it will shatter or shear the concrete according to the tool used, it does not injure properly installed service pipes even when they are only 6 inches under the concrete.

The manufacturer states that the rapid pavement breaker costs no more to operate than one mounted three-gun compressor but will break more concrete than ten of these outfits. By replacing the breaking tool with a tamping tool the dirt in a trench may be tamped as soon as refilled and a permanent top put on. This saves hand tamping and puddling, the placing of a temporary top and a long period of maintenance waiting for the trench to settle. In Westchester County, New York, a trench that had been hand tamped, puddled and had settled for five months was tamped down an average of over 18 inches without injury to a vitrified pipe 6 feet below. The National Demolition Corp., 96 Vreeland Ave., Nutley, N. J., has the distribution of the machine nationally. The machine is delivered upon an exclusive lease and royalty basis.

A Device to Eliminate Moldboard Chatter

THE Chatabator is a device for attaching to moldboard graders to prevent chatter. The runners carry the pressure instead of the cutting edge and take all the slack out of the grader mechanism. The Chatabator, made by the Rosco Manufacturing Co., Minneapolis, Minn., does not allow the blade to follow the contours of the road but forces it to trim and fill chuck holes and washboards as it goes. They also eliminate the tendency to loosen too much material in dry weather. With these devices, it is not necessary to windrow the material as drifting or spreading can be done at any rate of speed without the danger of chatter.

The extra heavy Chatabator has an 8-inch runner and is for the heavier graders. In certain localities power patrols are used for snow removal work. In this operation there is danger of throwing a large portion of the gravel off the road. The patrol is equipped with these devices and can maintain a speed of 10 miles an hour and not touch the road surface.

The Chatabator, a Device for the Elimination of Moldboard Chatter

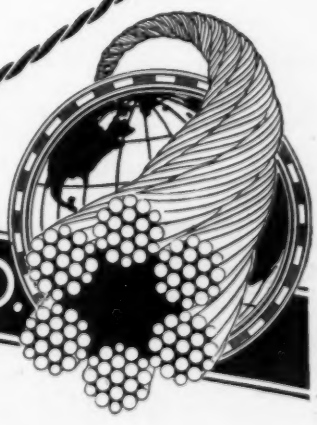
You can do a better job with

WILLIAMSPORT

No matter what your requirements are, you are, without doubt, ready to be convinced of superiority in the most vital part of your equipment—wire rope.

Our engineers are continually studying every problem that confronts the wire rope user and we are in position to give you most valuable advice without any obligation.

We are building wire rope for every specific need and you will find Williamsport far advanced in wire rope manufacture. Send us your next inquiry and note the difference in the way we do things.



WILLIAMSPORT WIRE ROPE CO.

General Sales Offices
PEOPLES GAS BLDG., CHICAGO
Main Office and Works
WILLIAMSPORT, PA.

Final Grade in One Operation

A MACHINE which produces final grade from the rough grade left by the shovels and graders, leaving an accurate sub-base for concrete slab has been announced by Chas. T. Topping Co., 125 Lexington Ave., Pittsburgh, Pa. The Topping Shallo-Grader is a self-contained machine operated by Models 20 or 30 McCormick-Deering tractors and is full crawler mounted and operated by one man. In one operation it handles shallow excavating or grade surfacing on any work requiring a cut of 15 inches or less. The machine cuts a swath 8 feet wide and discharges the excavated materials at either side or into wagons or trucks. It operates entirely independently of any other equipment such as forms and tractors and does not interfere with the passage of material trucks or other traffic. It turns in its own length and may move on or off the job quickly.

The excavating unit consists of a series of buckets with staggered teeth which rotate around and discharge onto an adjustable, reversible belt conveyor. This unit is suspended at the front of the machine and continuously cuts forward into the rough grade at a uniform speed determined by a choice of several low ratio traction speeds. The depth of the cut is

The Topping Shallo-Grader

accurately controlled by a power-operated reversible hoisting mechanism. The excavating unit may be tilted to develop crowns, super-elevated curves, etc. As the machine moves forward into the material each bucket makes a uniform depth of cut, producing a smooth, level graded surface on which the crawlers travel. Consequently the equilibrium of the machine is not affected by surface inequalities, which permits setting the excavating unit to grade as indicated by pointers which follow parallel work lines set at each side.

The machine is equipped with two distinct traction speed ratios providing four slow speeds for use when excavating and four higher speeds for traveling. The Topping Shallo-Grader is capable of excavating any material that can be satisfactorily plowed or scarified, at lineal speeds ranging from 75 to 450 feet, depending upon the character of the materials and the volume being excavated.

New Solder Repairs Aluminum and Other Metals

A SOLDER that will repair aluminum and other metals, including pot metal, die castings, cast iron and steel has recently been announced by the Allied Research Laboratories, Glendale, Calif. It is known as Alumaweld. It breaks down the structure of the metal being repaired and fuses or welds it to form a single piece. Alumaweld has a tensile strength of 12,000 pounds, is ductile and will take a polish over which chromium plating or any other plating can be applied. It is hard enough to be worked or machined, yet is malleable. It has a primary melting point of 370 degrees.

Making an Engine Repair with a Solder of 12,000 Pounds Tensile Strength

Once melted, however, there is a secondary melting point of from 50 to 250 degrees higher depending upon the period of time that the solder has been allowed to remain in a molten condition.

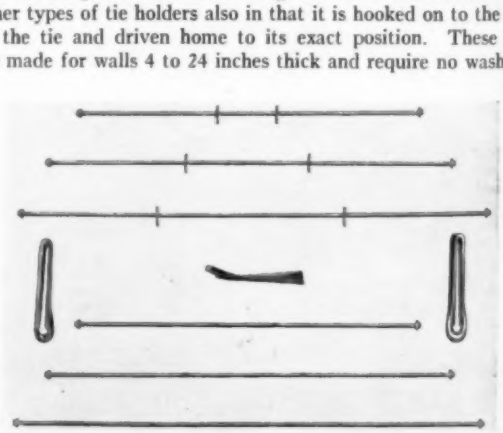
The uses of this new solder are numerous. It will repair aluminum apparatus and equipment, cylinder heads and crank cases on automobiles, heading plants, pipe lines and any other metal product. In many cases it has replaced welding with satisfactory results.

Alumaweld is applied to aluminum, pot metal and die castings with an ordinary soldering iron or blow torch without flux. For cast iron and steel a special flux is required. It will not corrode under ordinary circumstances, and it will not rust because of its neutrality combined with the fact that it fuses with the metals to which it is applied. Electrolysis is consequently eliminated.

A Self-Cutting Form Tie

A NEW self-cutting form tie known as the Richmond Snap-Ty is being marketed by the Richmond Screw Anchor Co., Inc., 249 Bush St., Brooklyn, N. Y. This tie is designed for use with 1-inch lagging, 2 x 4-inch studs and double wales. It has a working load value of 3,000 pounds per tie although its ultimate strength is better than 4,000 pounds, which allows an ample margin for safety. These ties do not have to be pulled or cut off as they snap off at the wall surface after the forms are stripped. The hole at the end of the tie is then easily patched.

The holder for the Richmond Snap-Ty is of the gravity type so designed that vibration tightens it. It is different from other types of tie holders also in that it is hooked on to the end of the tie and driven home to its exact position. These ties are made for walls 4 to 24 inches thick and require no washers.



The Richmond Snap-Ty, the New Self-Cutting Form Tie

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NEW LOW PRICE *on* "D-A"

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Now Offers You... ...Even Greater
VALUE *and* ECONOMY

A new, low price... *plus* new, positive, guaranteed uniformity that further improves the quality and performance of D-A Lubricant. Why gamble with substitutes or imitations? Use genuine D-A Lubricant for the protection of your equipment. It pays!

Order from your Dealer, our salesman or direct from factory. Immediate shipment. Warehouse stocks everywhere.

D-A LUBRICANT CO., Inc.
INDIANAPOLIS

***Now* 14½¢** IN FULL DRUMS

For 11 Years... *THE* SEMI-FLUID LUBRICANT for Gears and Bearings

PUT IT ON RIGHT WITH AN "ETNYRE"

The building of truly good bituminous roads depends almost entirely upon the even distribution of the bitumen. ETNYRE Oil, Tar and Asphalt Distributors are designed especially to give uniform distribution along with their perfect heating system and many other special ETNYRE features.

Year in and year out, ETNYRE DISTRIBUTORS have been achieving increasing popularity because of their high efficiency, their dependability, and their low cost of operation.

Send for full details on the ETNYRE LINE

Etnyre OREGON ILL.

Above is an unretouched photograph of an ETNYRE 1500-gallon Model F Distributor applying seal coat on bituminous macadam construction State Road Project at Watch Hill, Town of Westerly, R. I. One of a fleet of six ETNYRES owned and operated by the C. C. Plumb Contracting Co., Providence, R. I.

MANUFACTURED BY

E. D. Etnyre and Co.
OREGON ILLINOIS

A Russell Three-Blade Drag

Steel Road Drags

THERE are many sizes and types of road drags for many requirements. Russell steel drags, built by B. W. & Leo Harris Co., University Avenue and 25th St., S. E., Minneapolis, Minn., are built of all steel except the platform. The blades are practically the only parts that wear and they may be replaced at a small cost. The blades, being adjustable, will meet with any road condition. They are of special carbon steel, with angle iron bolted to the back of the blade for strength. Spring lock washers on all of the bolts keep the nuts from working loose. Shoulder bolts are used in all places where free movement is desired. These, too, are equipped with spring lock washers.

Russell road drags are adjustable by levers and the front blade may be set at a different angle from the rear blade. The grab link on the draft chain may be shifted to either side to allow running the drag in any angular position. The three-blade drags No. 14 and 15, which are 7 and 8 feet long respectively are built with three blades. One of the three blades will always float over the low spots releasing dirt into the depressions. The blades on these drags are placed in an offset position, so that all three blades travel at an angle and yet in the same path without the end of one blade extending beyond the other.

A New Centrifugal Sump Pump

ANNOUNCEMENT of the Cleco-Deming centrifugal sump pump with a number of new features and designed for the fast and effective expulsion of water, has been made by the Cleveland Pneumatic Tool Co., Cleveland, Ohio. Designed for general contracting work, including sewer, gas and water pipe jobs, ditch and trench digging, and construction involved in the building of cofferdams, foundations, bridges and other structures, this pump has already undergone numerous field tests.

The New Air-Operated C-D Centrifugal Sump Pump

Features of the C-D pump include economical operation through a material saving in air consumption. It is compact with a low center of gravity which prevents it from being upset and has an oil reservoir capacity of unusual size. The production of the pump involves collaboration of the Deming Pump Co., Salem, Ohio, which supplies the pump and the Cleveland Pneumatic Tool Co., which provides the motor and will merchandise the unit. The motor of the pump is operated by compressed air and is automatically lubricated from a reservoir located in the cylinder body. Patented oil control corrects lubrication troubles as the oil passes through large, unrestricted ports direct to the bearings and rotor.

The impeller is made of hardened bronze and is dynamically and statically balanced. It is designed for the exact conditions under which the pump will operate in sumps, manholes, bilges, tanks and other places. The water passages are well proportioned and screened against the entrance of stones, leaves, dirt and other foreign matter. The air consumption is from 15 to 20 cubic feet per minute less than similar types of centrifugal pumps, according to the claims of the manufacturer. With a 20-foot head, the capacity of the C-D pump is 142 gallons per minute at 90 pounds air pressure and 137 gallons a minute at 80 pounds air pressure. The unit weighs 36 pounds. Its outlet connection is a 2½-inch standard pipe thread and its air inlet is ½-inch standard pipe thread.

A New Light-Weight Electric Hammer

The New 9-Pound Electric Hammer

A NEW electric hammer weighing only 9 pounds has recently been placed on the market by the United States Electrical Tool Co., Department 95, 2490 West Sixth St., Cincinnati, Ohio. The light weight is made possible by operating the hammer through a special flexible shaft attachment connected with any light-weight ½-inch electric drill. In addition to the great decrease in weight for a hammer of this capacity it is claimed that the flexible shaft also prolongs the the life of the tool by absorbing the destructive jarring otherwise imposed on the power unit.

The specifications claim 4,000 blows per minute up to one inch, the finest Swedish steel in the hammer member, and high grade ball and roller bearings throughout.

Warning Lights for Construction Work

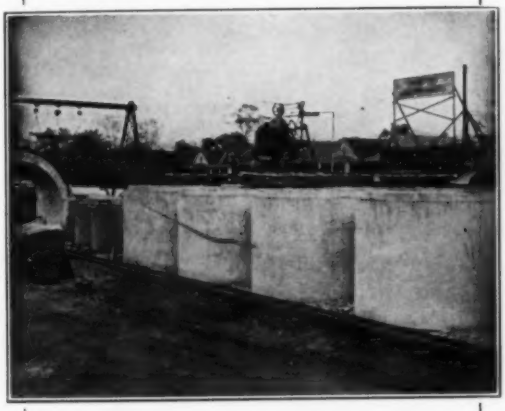
OIL lanterns with ruby globes for use as warning lights wherever construction work is in progress are made by the Embury Manufacturing Co., Warsaw, N. Y. These Supreme lanterns are dependable in operation, rugged in construction and possess high lighting power. The rising cone burner, embodied in the cold blast lanterns, makes the wick easy to trim and light. By simply raising the globe, the burner is directly accessible. A large brass filler makes the fount easy to fill without wasting oil.

The Embury Little Supreme Lantern

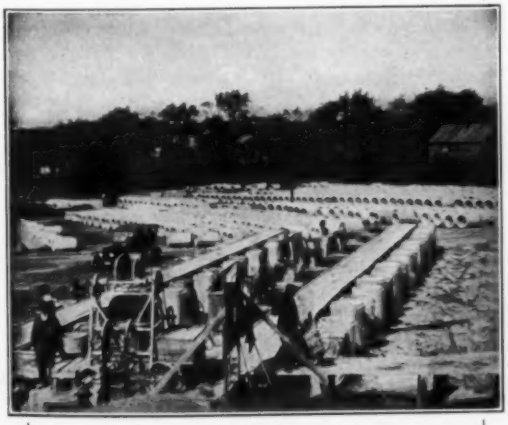
These lanterns are made in a number of sizes and styles to meet the varying requirements of contractors. The globes may be obtained in green, amber or blue colors as well as ruby, all of which always retain their original color. Large users of lanterns for warning lights often prefer to have their names stamped in the oil fount for purposes of identification. This service may be procured at a small additional cost.

Newark
REINFORCED CONCRETE PIPE
"It makes a better joint"

Easily laid at small expense with perfect flow line.



NEWARK CONCRETE PIPE COMPANY
323 Broadway
Newark New Jersey



. . . . . *Slashing*
Excavating Costs

The Williams Type "MF" Multiple-Rope Bucket opens its mouth wider, bites in deeper, and operates faster.

DOUBLE-HINGE not only allows a wider spread of the open bucket but also a more rigid construction because of extremely short overhang of hinge shaft from the center block bearings.

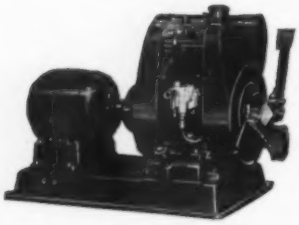
SIX-PART REEVING gives straightest lead of closing cable, and longer roller guards in the head give complete protection against fraying of the cable—greatly reducing cable wear and replacement cost.

Write for descriptive bulletin *We invite comparative tests*

WILLIAMS
FAST-DIGGING BUCKETS
Clamshell and Dragline Types for Every Purpose

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio
Birmingham Chicago New York Detroit Pittsburgh Mexico

Electric Light Plants for Construction Jobs



The New Onan 300-Watt A.C. Electric Plant

TWO electric light plants, for both D. C. and A. C. operation, have recently been announced by D. W. Onan & Sons, 43-51 Royalston Ave., Minneapolis, Minn. The D. C. model furnishes 110 volts without a battery, or a 32-volt current with a battery and supplies a bright steady light or power. The A. C. plants are built to furnish 110-volt, 6-cycle current.

The engines used on these are four-cycle, one-cylinder, 2¼-inch bore x 2¼-inch stroke, air-cooled and fitted with complete circulating oil systems, a large reservoir and return bearing ducts for constant running. These units are provided with suitable gasoline tanks for operating 10 to 12 hours on a filling and the production of electricity for their capacity will run from 3 to 10 hours on a single gallon of gasoline. The generators are of high grade construction fitted with waste packed bearings. The generator and engine are connected with a flicker removing coupling which insures a smooth steady light.

These plants can be set in any convenient place, started and put in operation without the necessity of bolting them to any kind of permanent base. The voltage is regulated by an automatic governor at the carburetor, and the light remains constant regardless of the load being used.

Concrete Cart and Wheelbarrow Scales

A CONCRETE cart and wheelbarrow scale, built in full compliance with the specifications of the American Road Builders Association, the Bureau of Standards and State Highway Departments, which provides for the speedy, accurate weighing of concrete aggregates, is manufactured by the Winslow Government Standard Scale Works, Terre Haute, Ind. This scale is built entirely of steel to combine strength, accuracy and durability, and yet it is light enough to make it readily portable. All parts are electrically welded. Its open type construction permits the easy inspection of all bearings and working parts and its broad flat feet make only ordinary hand leveling necessary.

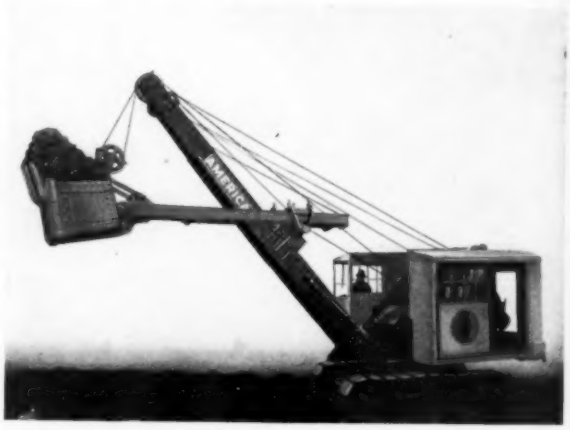
The scale has a tare beam and two material beams but can be furnished with additional ingredient beams to meet individual requirements. A tell-tale dial indicates the correct weights, and shifting trigger latches change from one material to another. The scale has a three-way approach, it being designed for a runway on each side. The weighing platform is 44 x 44 inches, amply large enough for two-wheel concrete carts or wheelbarrows.

Another scale manufactured by this company and especially designed for contractors is the Winslow junior wheelbarrow scale. This is a light sturdy portable scale which weighs both sand and gravel accurately and speedily, with a separate beam for each material, and a tell-tale dial to indicate the weights. It is equipped with four handles welded to the base, making it easily portable by two men. It is of all-steel construction, electrically welded to make a one-piece unit. The platform and runways are ¼-inch diamond plate. This scale, which like the other scale complies fully with standard specifications, is finished with a durable weather resisting aluminum paint and is shipped fully assembled ready for use on the job.

The Winslow Junior Wheelbarrow Scale

A New Model Shovel-Crane-Dragline

A SHOVEL-CRANE-DRAGLINE, either gasoline or diesel engine operated and built in five sizes, has recently been announced by the American Hoist & Derrick Co., Saint Paul, Minn. This American Gopher machine is built in ¾-yard, 1-yard, 1¼-yard, 1½-yard and 1¾-yard sizes. All are mounted on continuous chain crawler treads with two speeds. Each of these sizes is newly designed, combining new features such as compactness, simplicity of design, increases strength of wearing parts, ease and convenience of operation, and levers with "fingertip" control.



The New American Gopher Shovel

New Track Type Tracks for Wagons

A WAGON track designed to fit any make of track wagon, new or old, has been announced by the Tractor Division of Allis-Chalmers Mfg. Co., Milwaukee, Wis. The design, materials and workmanship of the new track are the same as those used in Allis-Chalmers track-type tractors. It is claimed that these tracks are easy pulling and self-cleaning. A four point support is provided for each track by two end wheels and two truck wheels. The load is moved easily with minimum power as it is moved over the tracks like railway truck wheels rolling on rails.

The track shoes are the same as used on the Model L tractor. The links are drop forged and heat-treated to assure hardness and toughness. The pins and bushings are case hardened and so designed that natural wear does not affect the ease of pulling. A strong one-piece frame supports the truck, track wheels and two end wheels. This frame is made up of welded steel plates rigidly braced by steel ribs which are welded on at points where the stress is greatest.

The track unit is mounted midway between the end wheels and truck wheels, and is free to pivot about the axles. A tube is welded into the side plates of the frame and is fitted with bushings of various lengths and diameters, simplifying installation on wagons of various makes. Truck wheels and end wheels are mounted on roller bearings having spring compensating cork seals to keep the oil in and the dirt out.

Jaeger Heavy Duty 10 S Holds 2 Bags

Built of Steel - ½ ton lighter, 50% stronger

AUTOMATIC SKIP SHAKER

Stops that man from pounding loader out of shape.

100% BALL BEARING

Fast - Portable - Sturdy

Skip Shaker loader, remixing drum action, Accurate Measure Water Tank and fast discharge (8 to 11 seconds) mean more thoro mixed concrete per day. Machined steel tracks, chilled ground faced rollers and ball bearings save power, save wear. Direct drive, one man control, dual tires for soft and hard ground.

Get our low prices, terms on tilters or non-tilters, 3½ to 56-ft. sizes — OK'd by over 85,000 users.

7-S SPEED KING

THE JAEGER MACHINE COMPANY
701 DUBLIN AVE., COLUMBUS, OHIO

BERG

HI-WAY SURFACER

Cuts down high spots, uneven expansion joints, repaired patches — quicker, better and more economically than any other machine or method. Used and endorsed by State Highway departments, municipalities, leading highway engineers and contractors throughout the country. Complete details and prices of the New, Improved BERG will be mailed on request.

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Asphalt Products

Standard Cut-Back Asphalt for Surface Treatment and Mixed in Place Construction.

Standard Asphalt Binder A for Surface Treatment.

Standard Asphalt Binders B and C for Penetration Work (Asphalt Macadam).

Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method. (Asphaltic Concrete.)

Standard Cold Patch Asphalt for all types of patching.

Standard Refined Asphalt for Sheet Asphalt paving.

Standard Asphalt Joint Fillers.

Standard Waterproofing Asphalt.

Specifications and all other particulars furnished on request.

SO NY SOCONY ASPHALTS AND ROAD OILS

STANDARD OIL COMPANY OF NEW YORK, INC., 26 BROADWAY

A Rear View of the New LaPlant-Choate Road-Builder

A Tractor-Mounted Trail and Road Builder

A NEW piece of equipment, designed especially for trail building, digging on uneven ground, rocks, clay and other materials found in rocky and mountainous regions, has recently been announced by the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa.

The main frame of this LaPlant-Choate Road-Builder completely surrounds the tractor. The box construction on the rear in which the hydraulic jack is placed acts as a reinforcement to the frame and makes it more rigid to withstand the sidehill cutting abuse to which such a piece of equipment is subjected. At the front of the main frame the V-nose is reinforced by a large ⅜-inch thick plate, which is electric welded on both the top and bottom of the converging H-beams. At the front of the frame on each side are placed rub rollers, which contact a plate at the back of the blade, enabling the blade to oscillate up and down with the least amount of friction. The blade edge is held in any position desired by means of locks. These hold the blade at a positive point so that it may be set at an angle to the road bed or may be set parallel to the desired road bed even though the tractor is at an angle.

The heavy moldboard is 9/16-inch thick and is made of carbon steel. It is backed up in the rear by several steel castings which form natural ribs to brace the blade. At the rear base of the blade, which on the standard model is 8 feet 4 inches long and 23 inches high and on the hillside model, 9 feet 4 inches long and 23 inches high, there is a heavy ⅜-inch plate to reinforce the blade and cutting edge, which is ¾-inch x 8 inches, and double edged so that it can be reversed.

The hydraulic jack is placed in a horizontal position in the rear cross-tie bar of the main frame. This jack pushes outward on a piston, to which is attached a yoke containing a sheave. The dead-end of the cable is attached inside the rear cross frame, passes around the sheave in the yoke, then around the lower sheave in the sheave bracket over the upper sheave and from there anchoring to the drawbar. This drawbar is made of a one-piece steel casting with the pullbar jaw attached. When the oil is forced into the hydraulic jack, the piston goes outward, taking up the slack and thereby raising the front of the blade. Due to the long leverage from the front of the blade to the center pivot mounting and from there back to the rear cross-tie, a large power leverage is obtained with which to raise the blade even when the tractor is pushing forward.

The rear cross-frame is bolted and welded to the side members so that the entire frame is one complete unit. This frame is bent in at the rear corners to allow the machine to work close to a side bank, and enables it to turn sharply to shove the load over the edge of the cut. Another feature is a 36-inch lift with a special moldboard, having heat-treated cutting bits at each end of the blade for cutting in the side of hills or mountains. When the tractor is needed for other work, it is merely necessary to pull the two center bearing shafts, which are in split sections, drop the frame on the ground and drive the tractor out over the front.

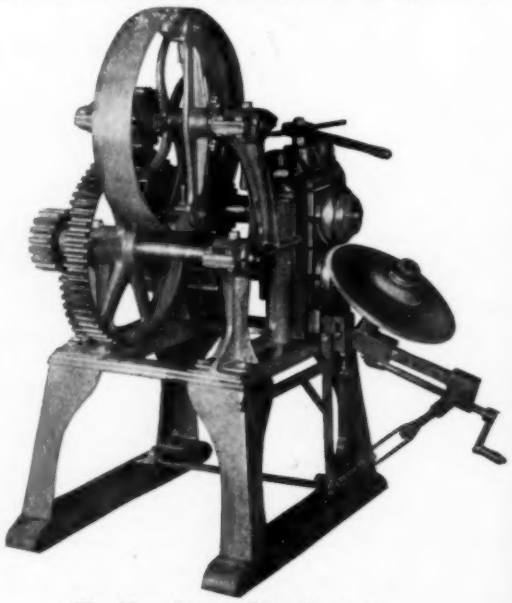
A New Line of Heavy-Duty Trucks

A NEW super-duty line of motor trucks has recently been announced by the Relay Motors Corp., Lima, Ohio. The two models, No. 230 and No. 240, of 5 and 7½-ton capacity respectively, are powered by Hercules engines developing 126 and 162 horsepower respectively. These trucks have new heat-treated frames of the fish belly type with 11½-inch channels for the Model 230, and 12½-inch for the Model 240. A newly designed 15-speed Brown-Lipe transmission is standard equipment. The cabs are thoroughly insulated and equipped with hot water heaters. Shatterproof glass is used throughout.

Outstanding new motor features are the Nitralloy crankshaft with full counterweights. The Stellite valve seats are spun in. There are two water pumps, two oil filters and a large oil sump type air cleaner. The Relay principle for increasing the traction of the truck enables these units to carry heavier loads at higher speeds.

A Heavy-Duty Cold Rolling Disc Sharpener

A DISC sharpener which puts disc blades back into shape has been developed by the Skow Rotary Disc Sharpener Co., Newton, Iowa. This compact, sturdily built machine tends to hold the original size of the disc, only actual wear of the disc in service being lost. The disc is rotated between two wheels making sharpening a forging process in which the edge is toughened, giving it more ability to withstand wear. The original temper of the disc is not lost and it may be bevel rolled as desired. Disc blades which have become warped or bent are brought back into shape by the Skow rotary disc sharpener, thus materially reducing necessary replacements.

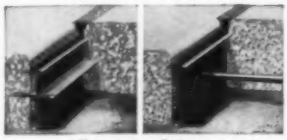


The Skow Rotary Disc Sharpener

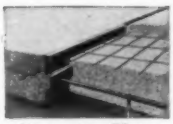
TRUSCON The Most Complete Line

Products for Reinforcing Roads and Pavements

Steel Post Curb Bar



Expansion Joints



Contraction Plate

Welded Steel Fabric

IMPROVED ROAD FORMS

Truscon Steel Road Forms embody many new improvements which still further increase their efficiency and economy. The wider base and reinforced brackets add greatly to their stability and strength. All forms are completely interchangeable with each other so that different height units may be used together. Perfect alignment is assured by specially designed sliding connections and wedges.

Truscon also manufactures Welded Steel Fabric, Reinforcing Bars, Contraction Plates, Expansion Joints, Guard Posts, All-Steel Highway Crossings and other steel products for highway construction.

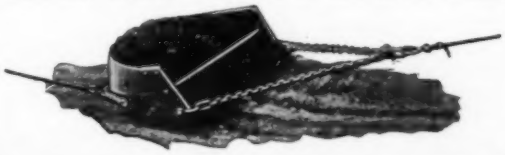
Write for catalogs and prices.

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO
Sales and Engineering Offices in all Principal Cities.

Sauerman "Crescent" Drag Scraper Cuts Dirt-Moving Costs to the Bone

Digs and hauls in one operation. Especially economical for cut-and-fill work, for digging gravel from hills, for foundation excavation and for stock-piling and reclaiming bulk materials. Handling capacities: 10 to 600 cu. yd. per hour.

SAUERMAN BROS., INC., 464 S. Clinton St., Chicago



LAUSON

LA-815
1¼-1½-hp.
Air-Cooled

MANUFACTURERS JOBBERS—DEALERS

There are 8 sizes of General Purpose Motors from ½ to 1¼-hp. Also other Lauson Vertical Engines, from 1½ to 3-hp.; and Horizontal Engines from 1½ to 18-hp. Write for details on the complete Lauson Line.

This Lauson 4-cycle General Purpose Motor is also furnished in the water-cooled type equipped for circulating water, radiator or tank cooler.

THE LAUSON CORPORATION 100 Ogden Avenue New Holstein, Wis.

It's False Economy

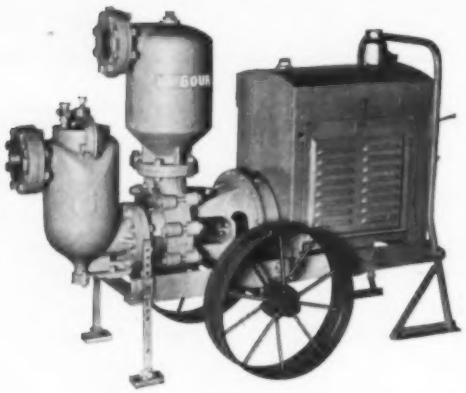
to lag behind in
the parade back to prosperity!

Not To Buy

Hercules Rollers
is to be out of step with
the opinions of federal—state—
county—township and city
highway officials and successful
contractors whose choice is

Hercules Rollers!

Marion, Ohio



The La Bour WPD Pump for Contractors' Service

Self-Priming Centrifugal Pumps for Contractors' Portable Service

THE priming of La Bour centrifugal pumps, manufactured by the La Bour Co., Inc., Elkhart, Ind., is accomplished by the entrainment of air using liquid recirculated to the pump from the air separator chamber on the discharge side. This patented principle of self-priming is the arresting or compensating of the recirculation after the pump has established its prime so that there is no continuous recirculation and no recirculation at all when the pump is handling straight liquids.

The accompanying illustration shows a Type WPD La Bour pump for dewatering excavations, caissons, cofferdams, etc. It has but one moving part and no valves or auxiliary apparatus. This unit may be built as an electric-motor-driven pump but is usually arranged for gas engine power as shown.

The impeller of the pump is the only moving part of the pump. It operates with side clearances of not less than 1/32-inch and usually with end clearances up to ¾-inch depending upon the size of the pump and the service requirement. There are no seal rings or similar parts and no thrust balancing apparatus is required. The suction opening in the casing is at the front and the discharge openings are double and at the periphery of the casing. Connected to the discharge opening from the casing is the separator.

A Six-Wheel Truck with Four-Wheel Drive

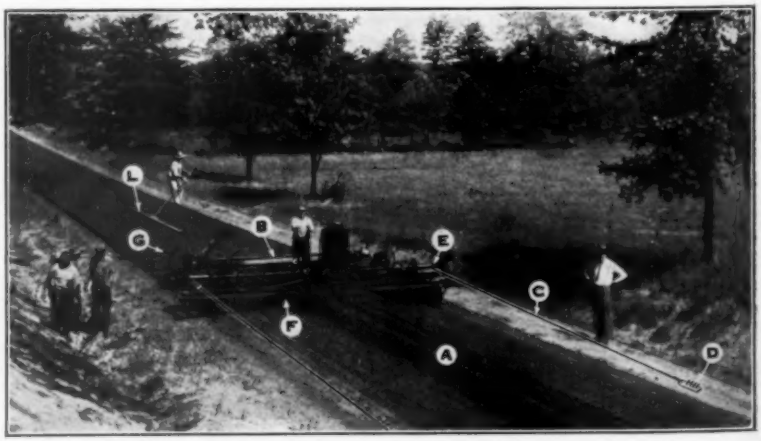
THE new X6 model announced by the Four Wheel Drive Auto Co., Clintonville, Wis., is a four-wheel drive six-wheel truck employing the regular FWD drive, a live front axle and first rear axle with a dead second rear axle. This new truck has a number of mechanical improvements. The motor and transmission have been lowered considerably, making an almost straight line drive between the transfer case and the two driving axles. The motor power has been increased with heavier units incorporated all along the driving line. Balloon tires of 10.50-20 size are used on all six wheels. The low mounted coupe-type cab is completely equipped including a unit instrument panel indirectly lighted. There is no skidding of the front wheels of the six wheeler when turning corners or traveling over slippery roads as power is applied to the front axle as well as to the first rear axle.

The weight is equally distributed over the three axles, the rear axles are placed as close together as possible, the end floats in the spring mountings and the axles themselves permit flexibility without distortion. By utilizing less than 25 per cent of the lateral side wall tire deflection permitted by tire manufacturers, the tendency of the tires on the two rear axles to scrub when turning corners is eliminated. Any tendency of the first rear axle housing to rotate as the power or the brake is applied is overcome by torsion rods which are made of seamless steel tubing. These rods are V-shaped with the open end of the V bolted to the torsion rod collar which in turn is bolted to the front end of the first rear axle differential housing. The other end of the V terminates in a drop forged end, having an eye passing over the hanging eye bolt with a spring above and below to cushion all movement.

A Mechanical Spreader and Surfacer for Black Top

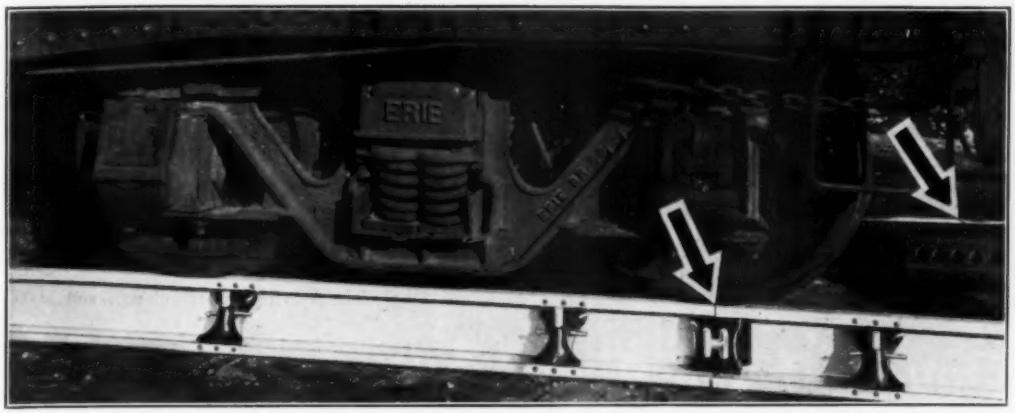
A POWER-DRIVEN machine for retread work handling macadam, sand asphalt, and tar-bound surfaces, capable of producing one mile of pavement per day has recently been announced by the Heltzel Steel Form & Iron Co., Warren, Ohio. Referring to the accompanying illustration the retread material is placed in a windrow A along the center of the road, as the final operation of mixing by the usual blading methods. The rear final spreader B does the final crowning of the material. A pair of steel cables C approximately 300 feet long and anchored as at D are wound on two drums E at either side of the machine to pull it forward. The drums are operated at the same rate when working on the straightaway or can be operated independently when negotiating curves. A V-shaped spreader and leveler F splits the windrow and spreads the material out to the side runners which are set to the desired width of road. Adjustable screws G regulate the height of the spreader. The manufacturer states that straight-edging after one pass of the machine shows the even spread of the material. The machine moves forward, under normal conditions, at a rate of 12 to 15 feet per minute and can be moved backwards under power by reversing the cables.

H. L. Sharp & Co., Parkman, Ohio, used one of these machines on an 18-foot road completing a mile a day at a saving of $50 per day over other methods.



The New Heltzel Power-Driven Spreader for Bituminous Retread Work

HELTZEL STEEL ROAD FORMS



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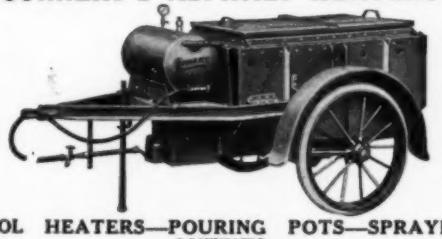
Note the strength of the Heltzel Joint. It supports a heavy all-steel gondola car in the same manner as a regular Railroad Joint. These Road Forms were taken from our standard stock.

OTHER HELTZEL PRODUCTS

STEEL FORMS—For building Roads, Curb, Gutter and Sidewalks. STEEL BINS—Portable Batching Plants, Cement Bins, Central Mixing Plants, Rectangular, Square or Circular Bolted Bins, Batchers and Scales. Finishing Tools and Miscellaneous Equipment.

THE HELTZEL STEEL FORM & IRON CO., WARREN, OHIO

CONNERY'S ASPHALT HEATERS



TOOL HEATERS—POURING POTS—SPRAYING OUTFITS

Lead Melting Pots—Oil Burners—Torches

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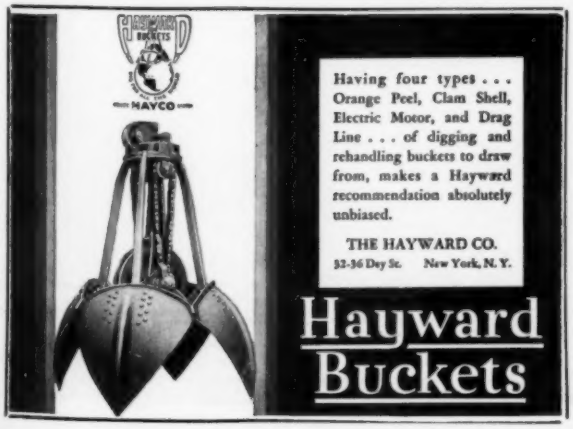
Connery & Company, Inc.

4000 N. Second Street, Philadelphia, Pa.



Having four types . . . Orange Peel, Clam Shell, Electric Motor, and Drag Line . . . of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

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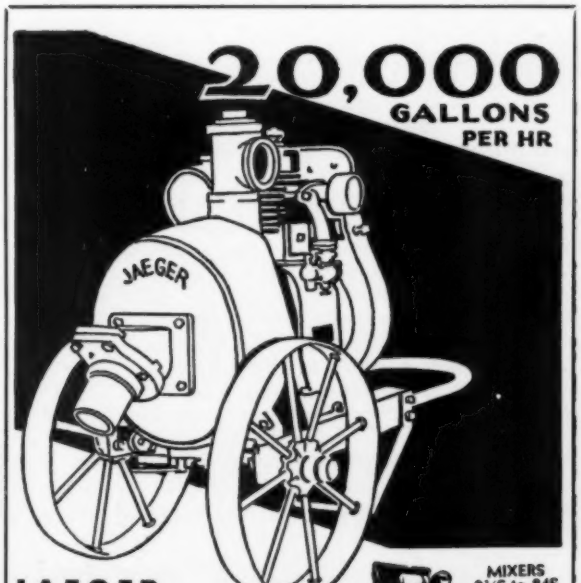
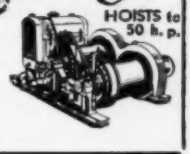


JAEGER 3" SELF-PRIME CENTRIFUGAL

100% automatic priming at lifts over 25 ft., heads up to 60 ft., 5 h. p. gas or electric power, wght. only 400 lbs., Timken equipped. One of a complete line. Get our 1932 prices.



The JAEGER MACHINE Co.
701 Dublin Avenue Columbus, Ohio

During April we hope you will remember to mention CONTRACTORS AND ENGINEERS MONTHLY.

The Fabriform Loader Mounted on a Case CI Tractor Equipped with Moon Tracks

A Loader for Handling Bulky Materials

A MACHINE for handling dirt, gravel, cement and other bulky materials for loading or charging trucks, hoppers, bins, conveyors or mixers has recently been announced by the Moon Track Co., McCormick Bldg., Chicago, Ill. This Fabriform loader which is of all steel construction, is built for use on the Case Model CI or McCormick-Deering Model 20 industrial tractors, with either wheels or Moon crawler tracks to fit individual requirements. The design of this equipment provides for easy mounting on the tractor, without the tractor construction being altered in any way. The 6-inch channel steel frame fits on each side of the tractor, while the front end is mounted to the tractor motor support casting and the rear end solidly held by steel brackets with clamps around grooves in rear axle housings.

Ample power is provided to dig in and fill the ½-yard bucket. While moving or while standing still, the shovel can be raised to the height desired. The automotive controls make manipulation of both shovel and tractor simple and easy and speed up the work. The shovel is operated by handy levers easily reached from the operator's seat. Power is taken from the sprocket on the right side of the tractor and is delivered to the cable drum by a short steel roller chain. An independent clutch on the cable drum operates the shovel. The cable drum, brake and clutch are mounted on a single shaft which rides in ball bearings. The shovel will lift 4,000 pounds at a rate of 68 feet per minute. As soon as the lifting clutch is released, the free wheeling type brake automatically holds the load in place while the bucket is tripped for emptying.

The Fabriform loader has an overall height of 9 feet, a loading height of 8 feet 6 inches and is 61 inches wide. The bucket which is of cylindrical construction with ribbed bracing is 48½ inches wide. Among its safety features are stops in the uprights to prevent damage to the sheaves, an unobstructed view between the uprights, and stop blocks to hold the shovel in an elevated position when cranking or working around the engine.

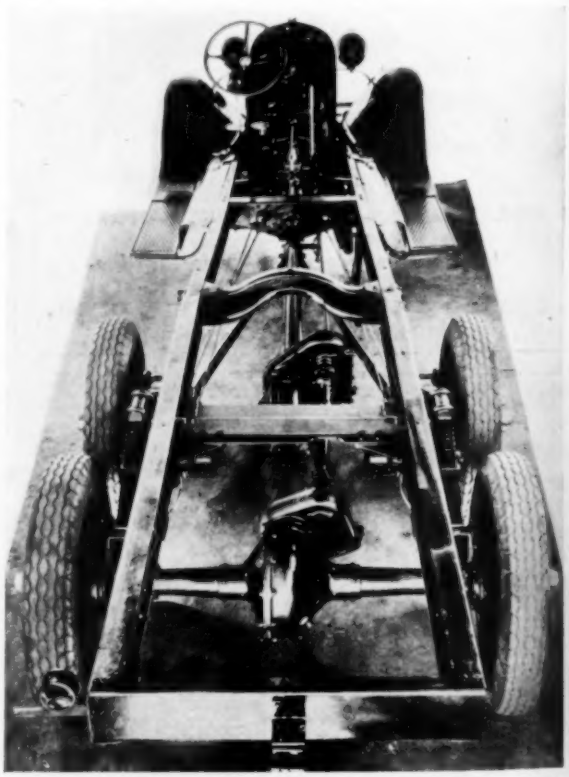
A Mechanically-Operated Scarifier for Tractors

A SCARIFIER for tractor mounting which is well suited for use between road forms or even for ice breaking has been announced by the Hi-Way Service Corp., 3841 W. Wisconsin Ave., Milwaukee, Wis. This Drott scarifier is mechanically-operated by a rear power take-off and has flexible speed both in raising and lowering with a range of 12 inches above ground level to 10 inches below. The teeth are adjustable to three positions and each tooth may be removed separately if necessary. Hook-up to the tractor is simple, only 10 to 15 minutes being needed to attach or detach the block from the tractor. There are eight 1 x 3 x 20-inch teeth with a spread of 8¼ inches between teeth and a total width of 5 feet 1 inch for scarifying. This mechanically-operated scarifier weighs 1,800 pounds.

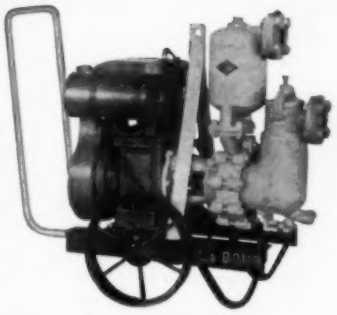
Converting a Light Truck to a Powerful Six-Wheeler

CONVERTING a Ford truck into a six-wheel unit capable of carrying 3½ to 5 tons is made possible by the Warford six wheeler unit which has recently been announced by the Warford Corp., 44 Whitehall St., New York City. This unit extends the wheelbase 43¾ inches and the wheel centers 40½ inches. The Warford six-wheel unit consists of a new Model AA Ford with the rear axle completely equipped with a right-hand and left-hand torque arm assembly, Warford spring seats, two Bendix cable brakes complete, and two special Warford wheel hubs with brake drums attached. Assembled to this axle is a rear gear set, consisting of a housing, gears, bearings, etc. The front gear case with bearings, gears, throw-out clutch, etc., is semi-assembled before shipping to the purchaser. The necessary spring seats, extra leaves for the springs, torque tube conversion parts and shift lever for the cab with rods and fittings, frame side rails, cross-rails, bolts, and all parts of spring seats with cross-supports are furnished. An oversize and longer torque tube drive shaft is furnished.

This six-wheeler unit provides two gear-driven axles or one as conditions may require, two differentials working independently, supplying traction for any hauling needs, it gives four-wheel drive with six-wheel capacity, six-wheel brakes, plenty of room for large bodies, and the opportunity to carry heavier loads. The driver has the choice of driving through the two rear axles or only one just by moving a lever in the cab.



Chassis of the New Warford Six-Wheeler



LaBour

The New No. 15 WPD

160 G.P.M. at 20-ft. Head or 20-ft. Suction Lift

Rugged and sturdy in design and construction, this newest LaBour contractors' pump is built to give the long, trouble-free service for which LaBour pumps are so widely known.

Powered with a 3-hp. Wisconsin engine, operating at 1,400 R.P.M., the No. 15 WPD is guaranteed to lift water 20 feet by suction and deliver 160 honest gallons per minute. It will deliver the same capacity against an equivalent discharge head. Balanced for easy handling on its wheels or by hook for pit work. Send for full information.

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SAND'S STEVENS NO. 555 LINE and SURFACE LEVEL

Strong, sturdy. Made of hard-drawn hexagonal aluminum tubing; nickel silver end pieces. Yellow fluid easy to see and quick acting; weighs only ½ ounce. Bottom surface flat for accurate surface leveling. Quickly attached to line. Special construction prevents accidental detachment from line. GET YOURS NOW. *Send us 50 cents or ask your Hardware dealer.*

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One-cylinder 300 to 1800 watts

MANY SIZES

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LITERATURE FREE FOR CONTRACTORS

You will find it worth while to check these lists each month and write for the catalogs you need.

Starting and Lighting Equipment

573 Complete information in regard to Auto-Lite starting, lighting and ignition equipment for construction machinery, the use of which means economy in time and money, may be secured from the Electric Auto-Lite Co., Toledo, Ohio.

A Powerful and Reliable Excavator

574 General Excavator Co., 220 Rose St., Marion, Ohio, will be glad to send to interested contractors complete information in regard to the General excavator, a ½-yard machine which is powered with a 62-horse-power engine and is readily convertible in the field.

Reinforced Concrete Pipe

575 Newark Concrete Pipe Co., 323 Broadway, Newark, N. J., will be glad to send to those interested a complete description of Newark reinforced concrete pipe which is easily and economically laid.

An Improved Line of Mixers

576 Construction Machinery Co., Waterloo, Iowa, will be glad to send to interested contractors a complete description of the improved modern Master drum-type mixers and the Wonder tilting mixers, as well as its line of hoists, pumps and saw rigs.

Reliable Dirt Movers

577 Complete information and prices on the Marion Mule, a feature of which is the oscillating front axle which permits an even haul over uneven roads, excavations or fill, may be secured by those interested from Marion Mules, Inc., Marion, Ohio.

Power for Construction Equipment

578 Continental Motors Corp., Muskegon, Mich., will be glad to send to those interested complete information in regard to its line of Continental motors for powering construction equipment, the performance of which is reliable and economical.

Rollers for Road Work

579 Complete information in regard to Hercules rollers, among the features of which are three speeds forward and three reverse, all gears enclosed, running in oil and mounted in anti-friction bearings, all-steel gyroscopic front end construction, all-steel frame, six-cylinder engine and an operating speed of 5 to 5½ miles per hour in high gear, may be secured on request from the Hercules Co., Marion, Ohio.

Oil Burning Tar and Asphalt Heaters

580 The Blue Book, describing Connery oil burning tar and asphalt kettles which are complete, modern, dependable and economical, may be secured by interested contractors from Connery & Co., Inc., 4000 N. Second St., Philadelphia, Pa.

Iron Pipe Railings

581 Complete information and prices on iron pipe railings for stairs, bridges or retaining walls may be secured by interested contractors from the Pipe Railing Construction Co., Fifth St., Long Island City, N. Y.

Expansion Joints for Concrete Roads

582 Carey Elastite expansion joints which protect concrete paving from the stresses of expansion and contraction are described in literature which the Philip Carey Co., Dept. E-1, Lockland, Cincinnati, Ohio, will be glad to send on request.

Explosives in Construction

583 Hercules Powder Co., Inc., 915 King St., Wilmington, Del., will be glad to send interested contractors complete information in regard to Hercules explosives for use in the various phases of construction, the features of which are maximum performance, economy and safety.

Safe Cold-Weather Concrete Construction

584 Full data on the use of calcium chloride for concrete construction in cold weather which speeds up the release of forms and protective equipment by insuring high early strength concrete may be secured by those interested from the Michigan Alkali Corp., 10 East 40th St., New York City; Dow Chemical Co., Midland, Mich.; Columbia Alkali Corp., Barberton, Ohio, and Solvay Sales Corp., 61 Broadway, New York City.

A Concrete Breaking and Tamping Machine

585 The National Demolition Corp., 95 Vreeland Ave., Nutley, N. J., will be pleased to send complete information regarding the exclusive lease and royalty basis of distributing the rapid pavement breaker, a truck-mounted unit which breaks concrete rapidly and to a line, and which also is used successfully to tamp backfill over pipe lines.

A Fine Grader Mounted on Crawlers

586 Fine grading ahead of the road forms may now be accomplished with the Topping Shallo-Grader which excavates a wide shallow trench with thirty-two buckets, leaving an undisturbed sub-base for the concrete slab. Complete information may be secured from the Charles T. Topping Co., 125 Lexington Ave., Pittsburgh, Pa.

Full-Revolving Convertible Excavators

587 Hanson full-revolving excavators with ¾ to ½-yard shovel capacities, which offer service as a shovel, dragline, clamshell, skimmer, trench hoe or crane, are described in literature which the Hanson Clutch & Machinery Co., Tiffin, O., will be very glad to send on request.

A Self-Cutting Form Tie

588 Contractors will be interested in the new self-cutting form tie known as Richmond Snap-Tys with a gravity holder which is tightened by vibration and requires no washers. A sample and complete information on the Snap-Ty may be secured from the Richmond Screw Anchor Co., Inc., 249 Bush St., Brooklyn, N. Y.

Portable and Stationary Asphalt Plants

589 A 20-page booklet describing and illustrating Cummer two-fire portable and stationary asphalt plants, stationary hot-mix plants, cold-mix plants, combination hot and cold-mix plants, dryer-coolers and steam-jacketed mixers will be sent to interested contractors on request by the F. D. Cummer & Son Co., 2016 Keith Bldg., Cleveland, O.

A New Shovel-Crane-Dragline in ¾ to 1¾-Yard Models

590 Complete descriptions of the new American Gopher shovel-crane-dragline with gasoline or diesel engine power made in ¾-yard, 1-yard, 1½-yard and 1¾-yard models may be secured from the American Hoist & Derrick Co., St. Paul, Minn.

Complete Steel Dredges

591 In Bulletin D-100, Hetherington & Berner, Inc., 701-745 Kentucky Ave., Indianapolis, Ind., describes its complete steel dredges, pumps and dredging machinery which are made in sizes from 6 to 15 inches.

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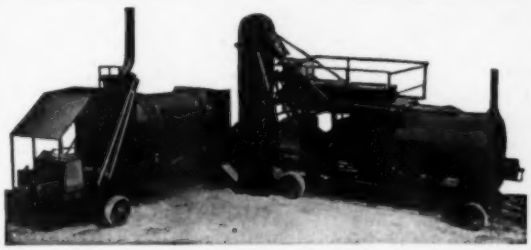

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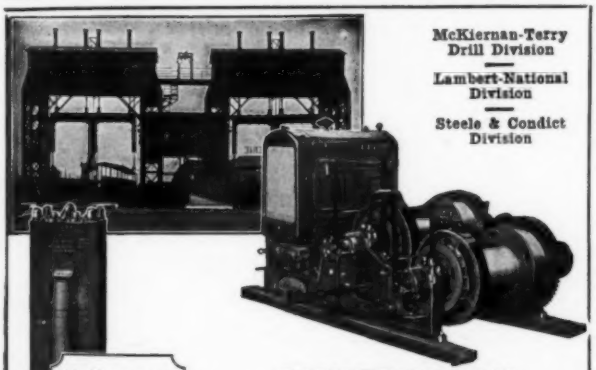

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Wood D6 Hoist and C12 Body, low-cost units for 1½-ton chassis, far outclass all other makes in heavy work, road service, and general contracting operations. They combine unexcelled economy of operation and fast, efficient performance with fine appearance which Wood alone can give. Sold under Wood's lifetime guarantee. Send for descriptive and illustrated literature.

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WOOD HOISTS & BODIES

An Hydraulic Bulldozer

592 Complete information in regard to the Euclid hydraulic bulldozer which is easily mounted on a tractor, leaving the tractor drawbar free so that it may be used with other equipment, as easily demounted and is made in sizes for a Thirty, Fifty or Sixty tractor, may be secured on request from the Euclid Road Machinery Co., Cleveland, Ohio.

A Complete Line of Jacks

593 The complete line of Joyce jacks which are designed to meet the variety of needs for equipment of this type in the construction industry is described in Bulletin No. 62 which the Joyce-Cridland Co., Dayton, Ohio, will be glad to send on request.

A Heavy-Duty Hydraulic Hoist

594 Bulletin No. 2-32, describing the Galion extra heavy-duty hydraulic hoist Model GH-56, among the features of which are the equalizing lift links, the self-aligning bearing of the drive shaft, the oil governor to prevent the overloading of the hydraulic system, the elimination of all screwed connections, the automatic locking of the body in any position and a one-unit type subframe construction, will be sent on request by the Galion Allsteel Body Co., Galion, Ohio.

Gas-Engine-Driven Welders

595 General Electric gas-engine-driven electric arc welders in 200, 300, 400 and 600-ampere capacities, powered by Buda gasoline engines and with a variety of mountings to suit individual needs are described in literature which the General Electric Co., Schenectady, N. Y., will be glad to send on request.

New 5 and 7½-Ton Trucks

596 A new super-duty line of motor trucks including Models 230, a 5-ton unit and Model 240, a 7½-ton unit has recently been announced by Relay Motors Corp., Lima, Ohio. These trucks are described in illustrated folders of special interest to contractors.

A Complete Portable Crushing and Screening Plant

597 Circular 321 issued by Universal Crusher Co., 625 C Ave., N. W., Cedar Rapids, Iowa, describes the Universal unit and dual crushing and screening plant particularly adaptable to the work of contractors.

New Wagon Tracks to Fit Any Track Wagon

598 The Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced a new wagon track designed to fit any make of track wagon new or old. Information regarding these tracks which are easy pulling and self cleaning may be secured from the manufacturer direct.

Storage and Batcher Bins

599 A new bulletin covering a complete line of bins including storage and aggregate bins, central mixing plants, bulk cement handling, automatic weigh batchers and all types of bin gates has recently been issued by the Beaumont Bin Co., 319 Arch St., Philadelphia, Pa.

Hydraulic Dredging Plants for Sand and Gravel

600 Bulletin 144 issued by Morris Machine Works, Baldwinsville, N. Y. describes the various types of hydraulic dredges which have proved suitable for sand and gravel production including revolving cutter dredges, suction screen dredges, plain suction dredges, hopper dredges, portable dredges and dredges operating with booster pumps.

A Tractor-Mounted Trail and Road Builder

601 The new LaPlant-Choate Road-Builder, especially designed for trail building, digging on uneven ground, rocks, clay and other material found in rocky and mountainous regions, and which may be supplied with a special moldboard with heat-treated cutting bits at each end of the blade for cutting in the side of hills and mountains, is described in Sales Manual No. 13 which the LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa will be glad to send on request.

A Concrete Cart and Wheelbarrow Scale

602 Literature describing the Winslow concrete cart and wheelbarrow scale, and the Winslow junior wheelbarrow scale especially designed for contractors' use, both of which are built in full compliance with standard specifications, and provide for speedy accurate weighing of concrete aggregates, may be secured by those interested from the Winslow Government Standard Scale Works, Terre Haute, Ind.

A Light Compression Tandem Roller

603 The Buffalo Springfield light compression multi-cylinder motor tandem roller especially adapted to rolling bricks before pouring the joints and for asphalt patching is completely described in four pages of specifications which will be sent free on request by the Buffalo Springfield Roller Co., Springfield, Ohio.

A Complete Line of Excavators

604 The Osgood Co., Marion, Ohio, will be glad to send to those interested complete information in regard to the Osgood line of shovels, including the ¾-yard Commander, the 1-yard Challenger, the 1¼-yard Conqueror and the 1½-yard Victor, all of which have tremendous crowding power with precision control.

A Surfacer for Highways

605 A complete description of the new improved Berg Hi-Way surfacer which cuts down high spots, uneven expansion joints and repair patches, may be secured by those interested from the Concrete Surfacing Machinery Co., 4159 Spring Grove Ave., Cincinnati, Ohio.

Heavy-Duty Buckets

606 The new Dreadnaught Bucket Catalog, Form 1339, which is just off the press, describes in detail the Blaw-Knox Dreadnaught bucket, the durability, efficiency and performance of which is guaranteed. Copies of this catalog may be secured by those interested from the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna.

Improved Road Forms

607 The improved Truscon steel road forms, among the features of which are the wider base and reinforcing brackets, the interchangeability of all forms so that different heights may be used together, and the specially designed sliding connections and wedges, are described in literature which the Truscon Steel Co., Youngstown, Ohio, will send on request.

Steel Sheet Piling

608 Carnegie Steel Co., Pittsburgh, Penna., will be glad to send to those interested complete information in regard to Carnegie steel sheet piling which is made in practical and well-designed sections, both straight and arch web, with an interlock of rugged construction, for modern and efficient construction of sea walls, breakwaters, jetties and piers.

Pneumatic Concrete Placers

609 A well-illustrated 24-page booklet, Bulletin No. 103 B, describing the Ransome pneumatic concrete placer and the grout mixer and placer for use in placing concrete in subways, railroad tunnels, water tunnels or sewers, may be secured by those interested from the Ransome Concrete Machinery Co., Dunellen, N. J. This book, which also contains air requirements, outputs and other operating data, is a hand book on placing concrete and grout by compressed air.

A New Jaw Crusher

610 The new Pioneer jaw-type crusher with an oil recirculating system, completely enclosed adjusting mechanism, a downward crowding action in the jaw and other features is described in the literature of the Pioneer Gravel Equipment Mfg. Co., 1515 Central Ave., Minneapolis, Minn.

The Wide Variety of Motor Trucks

611 The latest 32-page catalog of the International Harvester Co. of America, Inc., 606 South Michigan Ave., Chicago, Ill., describes and illustrates the International line of ¾, 1½, 2 and 3-ton speed trucks, Models A1, A2, Six-Speed Special, B-2, A3, AL3, A4, A5 and A6 motor trucks, built to meet present day fast hauling requirements. These trucks are of heavy-duty construction and have 23 wheelbases to provide a chassis to meet the requirements of specialized hauling.

Monograph on Industrial Lubricant

612 The Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill., began in April to publish each month a technical monograph on the lubrication of some type of equipment and will continue through the whole line of the more important industrial equipment, making each lubrication discussion simple, brief and informative, without reference to particular brands of lubricants. Requests for these monographs should be addressed to the Technical Division of the Standard Oil Co. of Indiana, at the above address.

A Device to Eliminate Chatter from Moldboards

613 The Chatabator, a device which completely eliminates all chatter and holds the moldboard of a grader rigid, relieving the blade of strain and the tendency to gouge, lightening the operator's work, makes the steering easier and completely eliminating washboards is described in the literature of the Rosco Mfg. Co., Minneapolis, Minn.

A Heavy-Duty Cold-Rolling Disc Sharpener

614 The Skow rotary disc sharpener which forges disc blades sharpening the edges and giving them more ability to withstand wear, which does not injure the original temper and prevents warping of the blades is described in literature which may be secured from the Skow Rotary Disc Sharpener Co., Newton, Iowa.

A Suction Line Primer for Centrifugal Pumps

615 The Hazleton suction line primer which keeps centrifugal pumps primed at all times after the initial installation has been made, and which is built for use on suction lines of 2 to 8-inch diameter, is completely described and illustrated in Bulletin 530, which may be secured from Barrett, Haentjens & Co., Hazleton, Pa.

A Complete Bulk Cement Plant

616 Butler Bin Co., Waukesha, Wis., will be glad to send to those interested complete information in regard to its complete portable bulk cement plant, which consists of storage bin, weighing batcher, power shovel and elevator, unloads a 300-barrel car of bulk cement in 2½ hours and on jobs has averaged a batch a minute.

Asphalt for Road Needs

617 Standard Oil Co. of New York, 26 Broadway, New York City, will be glad to send to those interested complete information in regard to Socony standard cut-back asphalt for surface treatment and mixed-in-place construction, Binder A for surface treatment, Binders B and C for penetration work, cold patch asphalt for all types of patching, asphalt joint fillers and waterproofing asphalt for street and highway construction and maintenance.

Contractors' Equipment

618 Worthington Pump & Machinery Corp., Harrison, N. J., will be glad to send to those interested complete information in regard to its line of contractors' equipment, including portable, semi-portable and stationary air compressors, centrifugal, power and deep well pumps, diesel engines, rock drills, pavement breakers, trench diggers, clay spades and backfill tampers.

Electric Welded Reinforcing

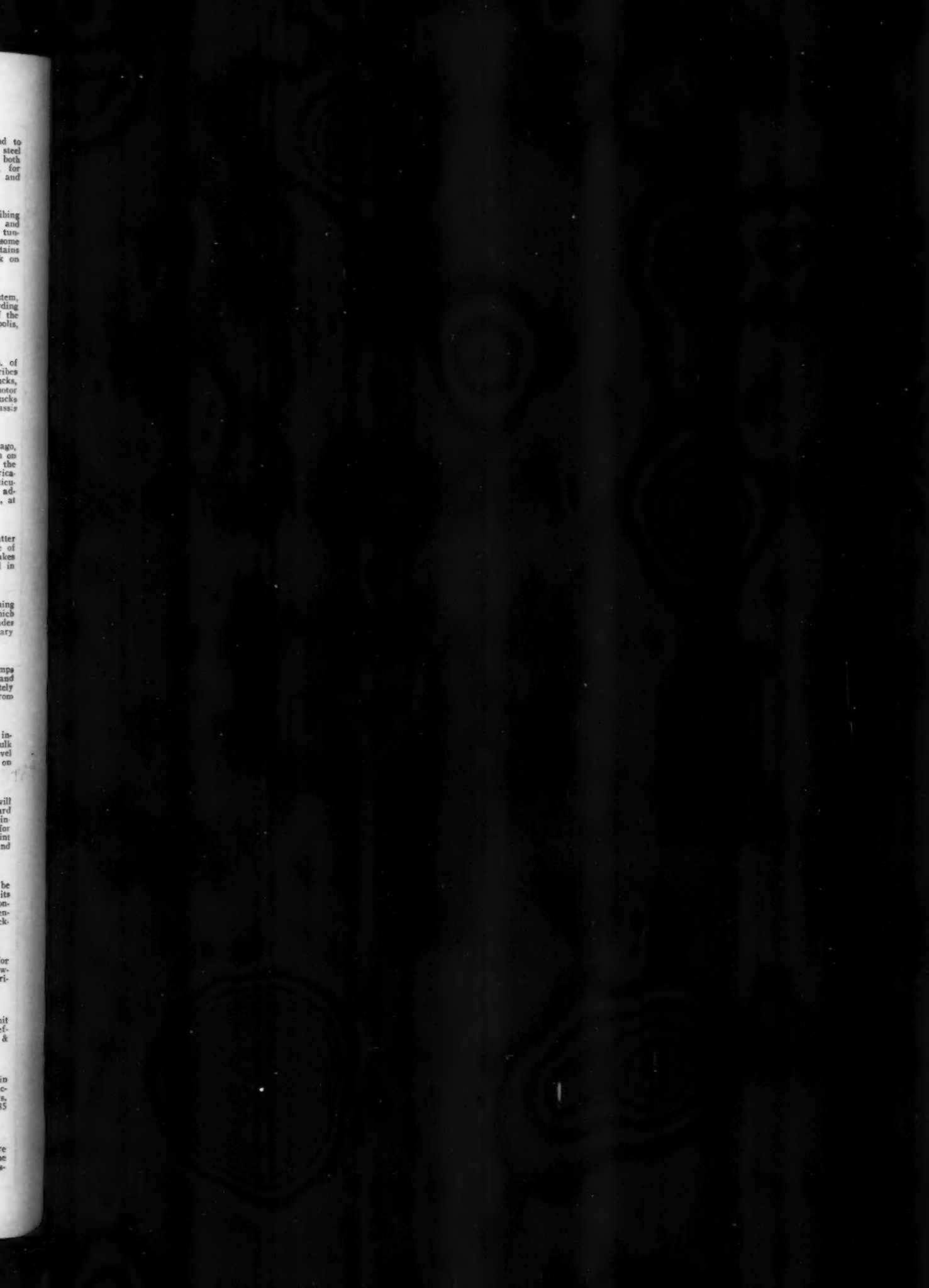
619 Complete information in regard to electric welded wire fabric for reinforcing concrete, the use of which keeps highways open and lowers maintenance, may be secured by interested contractors from the American Steel & Wire Co., 208 So. LaSalle St., Chicago, Ill.

A 1½-Yard Dump Body

620 The Wood Model D6 hoist and C4-1½-yard straight side body unit which combines capacity, sturdy construction, serviceability and efficiency is described in literature which the Wood Hydraulic Hoist & Body Co., Detroit, Mich., will be glad to send on request.

Twin-Cylinder Hydraulic Bulldozers

621 Bulletins No. 504 and 510 describing Baker Models 51 and 54 twin cylinder hydraulic bulldozers for Caterpillar Thirty and Sixty tractors, and Models 52 and 55 for Allis-Chalmers 35 and Model L tractors, may be secured by interested contractors from the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill.

Wire Rope for Construction Needs

622 Literature describing the special constructions of Williamsport wire rope for longer service and greater strength, as well as the new line of modern blocks, may be secured by those interested from the Williamsport Wire Rope Co., Williamsport, Penna.